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THE AMERICAN
JOURNAL OF PHARMACY

VOL. 96. NOVEMBER, 1924. NO. 11.

EDITORIAL

"YOUR DRUGGIST IS MORE THAN A MERCHANT."

Slogans have become very fashionable. Centuries ago also they were extremely popular. That was before the days of the still and when fighting was all the rage in Scotland, whence came the word. Then we are told that it meant "a battle song" or "war cry." Today, however, the word has come in another inheritance. States one dictionary, "a terse business phrase—a concise motto."

Advertising slogans are vitamins of the vocabulary designed as accessory substances in business building. And so as in any other business pertinent slogans of various kinds have become fashionable in the pharmaceutical world. Some prefer to call them impertinent.

Of these slogans the commonest are "Try the Drug Store First" and "Your Druggist is More Than a Merchant." No one disagrees with the second one mentioned, but the first is ambiguous —it is the one which the doctors have called impertinent. To them it has only one interpretation and it is this: If you have a headache, or an earache or any kind of an ache, and seek economical, temporary relief, *try the drug store first;* if you have a cough, asthmatic, whooping, bronchitic, tubercular—any kind of a cough—and you desire a masking of the symptoms—an insidious temporary "cure" —*try the drug store first;* if you have a boil or a bleeding cut or an infected wound and want inexpensive but inefficient treatment—*try the drug store first.*

These are the comments of the doctors, and in the ambiguity of the slogan is ample opportunity for such interpretations. It is a slogan that should be discouraged—yet it is well to note that the promoter of this phrase never meant to have it misunderstood as

above, for it was planned simply to call attention to the completeness and heterogeneity of the drug store stock.

A slogan which has been visited upon the druggist by the patent medicine advertiser is "Ask Your Druggist." But there is nothing new to that slogan. The druggist has been for many decades the local information bureau, and he has been asked for everything from abaca to zythum. To his credit it might be said that he generally has been all he was asked to be.

Commercially, however, as a business slogan, "Ask Your Druggist," is not much of a slogan. At least it does not carry much credit to the druggist if one judges it by the company it keeps in the advertising columns. Here for instance is advertised a rank, pernicious patent medicine and under its misleading and nauseating recital we read, "Ask Your Druggist for Testimonials." Elsewhere we read, "Recommended by Druggists Everywhere"—a phrase typical of the temerity and rascality of the race of swindlers that yesterday concocted tuberculosis and cancer "cures," and whose progeny in this day sponsor the rankest quackeries.

We are not greatly impressed by those who for "the sake of humanity" and other unimportant reasons vilify legitimate and worthy proprietary medicines and who forget that many preparations of the Pharmacopeia and National Formulary in daily use are only patterned after proprietary medicines—but our choler scorches and our blood pressure spurts when we read the advertisement of a worthless quackery, to which the arrant copy man has added his slogan—

"Recommended by Reliable Druggists Everywhere."

Every honest druggist should resent such an unwarranted slander upon his reliability and integrity.

If there is need of a slogan to advertise the worth and need of the druggist to the community let it be a slogan designed in truth such as—

"Your Druggist is More Than a Merchant."

The druggist is not a mere seller of wares—he is the doctor's ally in ministering to the sick. He is specially trained to dispense potent medicinal substances—he is a well-informed chemist—he is a neighborhood necessity. It is to that end and for that reason that "Your Druggist is More Than a Merchant."

IVOR GRIFFITH.

THE ETYMOLOGY OF THE SYLLABLE "TOX."

Couch's comprehensive and informing dissertation (THIS JOURNAL, 1924, *96*, 746), on the evolution of the term "toxin" suggests a brief discussion of the basic meaning of the root-syllable, which, as he notes, has found its way into a large number of words, always carrying with it the significance of poisoning. In common language the most familiar occurrence of the syllable is in the word "intoxication," which, until a comparatively recent time, related directly to alcoholic poisoning, but has been widened in scope in modern medicine and the term "auto-intoxication" has become thoroughly familiar.

The Greek neuter noun "toxon" from which the syllable is derived means a "bow," and in the plural was used for the bow and arrow and even for arrows alone. A derived (neuter) adjective form "toxikon," used with the neuter noun "pharmikon" "drug" gives us "bow drug," that is, a substance used to render the arrow more effective. Primitive man probably soon found that while the bow was valuable as a weapon on account of the comparative swiftness and accuracy of the projectile, the wound was apt to be slight, therefore, resorted to arrows tipped with poisons either of vegetable or animal origin. The virulence of snake venom must have been noted at a very early period. The statement in Genesis that the serpent was the most subtle of all the beasts of the field is an expression of this knowledge. It was a comparatively easy task to transfer some such venom to the arrow.

Except as to technical terms directly coined for scientific use, the majority of English words derived from Greek or Latin have come into the language through the French. Littré, unfortunately, gives no special information as to the earliest use of the word in French. The New English Dictionary gives references to words of the type as early as the beginning of the seventeenth century. It may be noted as a curious fact that a word "toxology" exists which means "archery." The Greeks spoke of the Persians as defenders with the bow, in contrast with themselves who were spear users.

Reference to the bow, suggests the "rainbow," and it will at first thought seem that no connection exists between this and the weapon. As a fact, however, the word used in Hebrew allusions to the rainbow means the weapon. The bow, as it appeared in the heavens, has the shape of the weapon, and was regarded as that

of the Deity. He had, in anger at the wickness of mankind, destroyed all but a few, but made a vow to those saved and to their descendants, that he would not again destroy the world by a flood. As earnest of this promise, the weapon is hung up, an action that, of course, signifies the cessation of hostilities. "And it shall come to pass when I bring a cloud over the earth, that the bow shall be seen in the cloud and I will remember my covenant which is between me and you and every living creature of all flesh; and the waters shall no more become a flood to destroy all flesh." The Hebrews saw the bow frequently after storms, and regarded its exhibition as a renewal of the pledge.

It is interesting to note the contrast between the Greek and Jewish mind in the interpretation of this natural phenomenon. The Greeks speculated on its cause, ignoring any significance that it might have. They were of the opinion that it was in some way due to the action of raindrops, but having no knowledge of the composition of white light could not account for the colors. The Jews gave no thought to the nature of the phenomenon, but interpreted it as having a significance and as indicating the purpose of Deity to cease the war upon the human species. Peace had come.

> "Our bruised arms hung up for monuments
> Our stern alarums changed to merry greetings."

An allusion to the use of arrow poison is found in Job, vi, 4, "For the arrows of the Almighty are within me; the poison whereof my spirit drinketh up."

HENRY LEFFMANN.

ORIGINAL ARTICLES

THE PHYSIOLOGICAL VALUE OF BRITISH COLUMBIAN FOXGLOVES.

By James Arnold Dauphinee.

[The author is indebted to the "Honorary Advisory Council for Scientific and Industrial Research" of Canada, for financial aid in carrying out this investigation.]

The following report is an account of an investigation carried on during the year 1922-23 into the therapeutical value of the glucosidal content of British Columbia grown foxglove leaves (Digi-

talis purpurea, Hinni); and also into the effect, if any, of different fertilizers upon this value.

Five different samples of cultivated leaves have been analyzed by two different methods: (a) the "cat method" of Hatcher and Brody;[1] and (b) the "guinea-pig method" of Reed and Vanderkleed.[2] The plants from which the leaves were taken were originally growing wild in the Burnaby Lake region. They were transferred to the Botanical Gardens of the university at Point Grey. Here they were planted in four plots each eight feet wide and twenty-one feet long. There were on the average one hundred and fifty plants in each plot. The details of the plots are as follows:

TABLE I.

Plot No.	Species of Plant	Colour of Flowers	Fertilizer	Amount of Fertilizer	Yield of Dry Leaves
1	Digitalis purpurea	(a) Purple (b) White (var. alba.)	Cow Manure	100 lbs.	4 lbs.
2	Digitalis purpurea	Purple	Ammonium Sulphate	2 lbs.	2 lbs.
3	Digitalis purpurea	Purple	Super Phosphate	4 lbs.	2 lbs.
4	Digitalis purpurea	Purple	None	0 lbs.	2 lbs.

The plants were one and two-year-old specimens before they were transplanted. They were grown under the influence of the above fertilizers for a period of one year. The leaves were collected during the last week of June, 1922, just while the plants were flowering. All the leaves were removed from the plants and were dried in the shade on specially made trays. They were dried in this manner for four weeks and then made into tight bundles and sent to the laboratory.

When received at the laboratory they were further dried in dessicators in a partial vacuum over lime until their petioles would break with a sharp fracture. The deeply stained brown leaves were discarded. The remainder of the leaves were crushed and ground to a No. 60 powder and then placed in air-tight brown glass containers.

Tinctures were prepared from each specimen of leaves according to the directions given in the U. S. P. IX under the heading "Type Process P. Percolation," page 444.

Standardization of the Tinctures by Cats.

The cats used in the following experiments were of no particular variety and were obtained in various parts of the city. The exact details of the procedure[3] were as follows: Ten cubic centimeters of the tincture to be assayed were diluted to one hundred cubic centimeters with physiological salt solution (75% Nacl), and a portion of this solution was transferred to a burette to which was attached a small canula by means of a fairly long piece of rubber tubing.

The cat was then anesthetized with ether in a bell jar and as soon as it was unconscious it was transferred to a catboard and tied down. The solution was run from the burette into the femoral vein at a rate of 2 cc. a minute for the first five minutes, and thereafter at a rate of 1 cc. every two minutes until the heart of the cat stopped beating. The amount of solution injected, and the time of injection was noted, and the cat was weighed. From this data the amount of drug necessary to kill the cat, per kg. of body weight, was calculated. This calculated value is the so-called "cat unit" of Hatcher and Brody.[1]

The complete analysis of tincture No. 7 is given in Table II. The strengths of the various other tinctures were obtained in a similar manner and the values thus found are summarized in Table IV.

TABLE II.

TINCTURE NO. 7. DIGITALIS PURPUREA (PURPLE FLOWERS). FERTILIZER—COW MANURE.

No.	Date	Weight of Cat	Sex	Time of Injection	Total Volume Injected	Volume per Kg.	Cat Unit
5	Jan. 30	2998 gms.	Female	24 mins.	19.5 cc.	6.5 cc.	0.065 gms.
6	Feb. 7	2909 gms.	Female	23 mins.	19.0 cc.	6.53 cc.	0.065 gms.
7	Feb. 7	2839 gms.	Female	17 mins.	17.0 cc.	5.99 cc.	0.0599 gms.

Average "cat-unit" (Nos. 5, 6, 7)—0.0634 gms.

Standardization by Guinea Pigs.

The guinea pigs used in the following experiment were of the ordinary variety and procured from the laboratory of the Vancouver General Hospital. They were first weighed and prepared for injection by clipping the hair off a square inch of the abdomen and painting this clipped area with iodine.

The solutions for injection were prepared as follows: Ten cubic centimeters of the tincture to be assayed were freed from the greater part of the alcohol by heating at a temperature of about 55 degrees C. for an hour and a half. This solution was then made up to its original volume with physiological salt solution (75% NaCl).

After the guinea pigs were weighed the dose for each was calculated on the basis of so much per 250 gms. of body weight. This dose was then injected beneath the skin of the abdomen by means of a Hitchen's syringe. The pigs were placed in boxes and the results noted at the end of twenty-four hours. When the approximate strength of the solution had thus been determined, a further series of pigs were injected with calculated doses ranging between the highest dose that did not kill and lowest dose that did kill, as found by the preliminary injections. The minimum lethal dose thus found was checked up by injecting another series of pigs. The complete analysis of Tincture No. 7 is given in Table III. The strengths of the other tinctures were obtained in a similar manner, and the values thus found for each are summarized in Table IV.

TABLE III.

TINCTURE NO. 7. DIGITALIS PURPUREA (PURPLE FLOWERS). FERTILIZER—COW MANURE.

No.	Date	Time	Kind	Weight	Dose per 250 gms.	Actual Dose	Result
16	Dec. 27	11.05	Blk.	565.5 gms.	.5 cc.	1.13 cc.	Dead
15	Dec. 27	11.15	Brn. Wht.	552.5 gms.	.4 cc.	.88 cc.	Dead
17	Dec. 27	11.20	Yel. Wht.	531.5 gms.	.3 cc.	.636 cc.	Alive
18	Dec. 29	4.10	Blk.	559.0 gms.	.38 cc.	.85 cc.	Dead
19	Dec. 29	4.15	Blk. Wht.	549.0 gms.	.36 cc.	.79 cc.	Alive
20	Dec. 29	4.20	Wht.	527.5 gms.	.34 cc.	.717 cc.	Alive
21	Jan. 3	2.15	Wht. Grey	419 gms.	.38 cc.	.638 cc.	Alive
22	Jan. 3	2.25	Blk. Wht.	392 gms.	.37 cc.	.581 cc.	Alive
23	Jan. 9	11.35	Blk.	446.5 gms.	.38 cc.	.676 cc.	Alive
24	Jan. 9	5.25	Yel.	382.5 gms.	.40 cc.	.612 cc.	Dead

As .40 cc. per 250 gms. caused the death of the animal each time given (Nos. 16, 24), and .38 cc. per 250 gms. killed it once (No. 18), but in the other two instances given (Nos. 21, 23) the animal lived, the minimum lethal dose per 250 gms. body weight of guinea pig is .40 cc.—0.040 gms.

The results obtained from the various tinctures are summarized in the following table:

TABLE IV.

Tincture No.	Particulars	Physiological Assay			
		Cats		Guinea Pigs	
		No. of Animals Used	M. L. D. per Kg.	No. of Animals Used	M. L. D. per 250 gms.
6	Digitalis purpurea, variety alba. Fertilizer—cow manure	4	0.0716 gms.	14	0.033 gms.
7	Digitalis purpurea (purple flowers). Fertilizer—cow manure	3	0.0634 gms.	10	0.040 gms.
8	Digitalis purpurea (purple flowers). Fertilizer — superphosphate	5	0.0772 gms.	10	0.045 gms.
9	Digitalis purpurea (purple flowers). Fertilizer—ammonium sulphate	2	0.0741 gms.	11	0.036 gms.
10	Commercial Preparation No. 1 diluted to tincture strength. Procured from the pharmacy of the V. G. H.	1	0.168 gms.	17	0.126 gms.
11	Commercial Preparation No. 2 diluted to tincture strength. Procured from the pharmacy of the V. G. H.	6	0.0857 gms.	14	0.048 gms.
12	Digitalis purpurea (purple flowers). No fertilizer	—	—	12	0.038 gms.

Clinical Report from the Vancouver General Hospital.

Through the kindness of the hospital authorities and especially Dr. Pearson, a prominent physician in the city, the various tinctures of digitalis used in this investigation were used in the hospital with gratifying results. The hospital record of only one case, used in the treatment of auricular fibrillation, will be presented.

Hosp. No. B23819
Heart Station No. 1782

THE VANCOUVER GENERAL HOSPITAL

Report of Heart Station

Name: T. C. Date: Sept. 14th, 1922.
Occupation: Labourer Age: 32 Service: Dr. Pearson Annex 7
Analysis of Cardiogram:—Arrhythmia: Total.
Extrasystoles: None.
Rate per minute: 165.
P waves: Absent.
T waves: Normal.
Conduction time P-R—sec. (normal .12 to .20 sec.)
Q-R-S .06 (normal .04 to .10 sec.)
Q-R-S-T .24 sec. (normal less than .38 sec.) Block: None.
Ventricular Preponderance: Decidedly left-sided.
Notes: Descending limb of S3 notched;
Unequal amplitude of R and S Waves throughout.
Few oscillations of Auricular fibrillation.
Interpretation of Electro-cardiographic findings:
Left Ventricular Preponderance.
Total Arrhythmia.
Absence of P Waves.
Auricular Fibrillation.

(Sgd.) B. D. GILLIES,
Director of Department.

Hosp. No. B23819
Heart Station No. 1788

THE VANCOUVER GENERAL HOSPITAL

Report of Heart Station

Name: T. C. Date: Sept. 25th, 1922.
Occupation: Labourer Age: 32 Service: Dr. Pearson Annex 7
Analysis of Cardiogram:—Arrhythmia: Total.
Extrasystoles: None.
Rate per minute: Varies from 75 to 100.
P waves: Absent.
T waves: Normal.
Conduction time P-R—sec. (normal .12 to .20 sec.)
Q-R-S .07 sec. (normal .04 to .10 sec.)
Q-R-S-T .32 sec. (normal less than .38 sec.) Block: .....

Ventricular preponderance: None.

Notes: Taken after administration of Tr. Digitalis 9 di. 40 min.—between midnight Sept. 16th and 8 P. M. Sept. 21st.

See report number 1782—Sept. 14th, 1922.

Interpretation of Electro-cardiographic findings:

Total Arrhythmia.

Absence of "P" waves.

Auricular Fibrillation.

Effects of Digitalis: Slow of rate; left ventricular preponderance disappeared; tendency to grouping of beats.

(Sgd.) B. D. GILLIES,
Director of Department.

Hosp. No. B23819
Heart Station No. 1798

THE VANCOUVER GENERAL HOSPITAL
Report of Heart Station

Name: T. C. Date: Oct. 2d, 1922.
Occupation: Labourer Age: 32 Service: Dr. Pearson Annex 7
Analysis of Cardiogram:—Arrhythmia: Pulsus Bigeminus.
Extrasystoles: Ventricular nearly every other beat, some right, others left.
Rate per minute: 80.
P waves: Absent.
T waves: Some diphasic in Dii-Inverted in Diii.
Conduction time P-R sec. (normal .12 to .20 sec.)
Q-R-S .06 sec. (normal .04 to .10 sec.)
Q-R-S-T .34 sec. (normal less than .39 sec.) Block: .....
Ventricular Preponderance: Left ventricular.

Notes: Digitalis leaves gr. 155 given for past two days—tinctures given before that.

Had Tinct. Digit. (Sept. 17-21) S X.

Digitalis Folia (Sept. 27 to Oct. 2) *Gr. XXIV.*

Interpretation of Electro-cardiographic findings:

Auricular Fibrillation.

Left Ventricular Preponderance.

Pulsus Bigeminus, and tendency to inversion of T2, show toxic effects of digitalis.

(Sgd.) B. D. GILLIES,
Director of Department.

Acknowledgments.

I wish to offer my sincerest thanks to Dr. A. H. Hutchinson, of the Department of Botany; Dr. R. H. Clark, of the Department of Chemistry; Professor John Davidson, of the Department of Botany, and to Drs. Strong and Pearson, of the Vancouver General Hospital, who were always ready to advise or assist me in this investigation.

Consideration of Results.

The results of the physiological assay by the cat method show very clearly that the B. C. leaves compare very favorably with those examined by Rowntree and Macht [3] obtained from Germany, England, and America. They found the cat units of these leaves to vary from 0.135 to .076. In fact, the "cat units" of all the preparations of B. C. digitalis leaves (with one exception) are slightly below the lowest found by these investigators for the best American leaves (0,076 gms.).

The results of the guinea pig assays show even more clearly that the British Columbia leaf has a high physiological value. Reed and Vanderkleed [2a] found M. L. D. for different preparations to vary from 0.06—0.125 grams for a 250-gram guinea pig. However, it is possible that the lowness of the results with the guinea pigs is due in part to a greater susceptibility of the animals used.

As regards the influence of fertilizers on the drug content, the results show quite definitely that those plants which have been fertilized with cow manure are slightly more potent than those which have been fertilized with either super-phosphate or Ammonium sulphate, and this, together with the fact that the yield of leaves is twice as great with cow manure (as shown by Table I), shows that this natural fertilizer is the best one to use in order to obtain both quantity and quality of digitalis leaves.

Conclusions.

It may be concluded, then, that

(1) The strength of the leaves examined is slightly higher than that of those grown elsewhere.

(2) Cow manure is the best fertilizer to use in order to obtain both quantity and quality of digitalis leaves. Ammonium Sulphate is better than no fertilizer at all and super-phosphate seems to decrease the yield of active principles.

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UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER, B. C.

A CONTRIBUTION TO THE CHEMISTRY OF ALKATAN.

Joseph S. Hepburn, A. M., M. S., Ph. D., and Robert H. Stroh.

Contribution From the Constantine Hering Research Laboratory, Hahnemann Medical College, Philadelphia.

According to Pittier,[1] three species of plants are known as *alcotán* in Costa Rica: *Piper acuminatissimum, Piper medium,* and *Baccharis trinervis.* The latter two species occur chiefly in the Pacific littoral. *P. acuminatissimum* is widely distributed in the great valley of the Rio San Juan. It contains an active principle which has not been isolated. If the leaf and its bud be chewed, a very intense, sourish sweet, pungent taste is noted, followed by violent nausea.

In English, *P. acuminatissimum* is known as alkatan. The tincture of its dried leaves has been used with apparent success in the treatment of diabetes mellitus in doses of 5 to 10 minims four times daily. The pharmacodynamic action of alkatan in both the tincture (10 per cent. drug strength in 80 per cent. alcohol) and the twelfth decimal dilution has been studied using twelve male

college students as subjects or provers.[2] The concentration of the dextrose in their fasting blood remained within normal values, hence alkatan does not act homœopathically, *i. e.* according to the law of similars. Any therapeutic result in diabetes must be attributed to physiological action.

The present study was made on dried leaves from the same lot as were used in the preparation of tincture for the pharmacodynamic study. They were ground so that the entire mass passed through a sieve with twenty meshes to the linear inch.

Gross Composition.

The constituents enumerated in Table I were determined according to the methods of the Association of Official Agricultural Chemists.[3] However, for the determination of reducing sugars as dextrose, 10 grams of the powdered leaves were extracted by boiling with approximately 75 mils of distilled water. The liquid was filtered through several thicknesses of gauze with the application of pressure. The residue was washed on the filter. The combined filtrate and washings were treated with alumina cream to precipitate suspended solids, and were then diluted to a volume of 100 mils. The precipitate was removed by filtration; and the clear filtrate was used for the volumetric determination of reducing sugar by means of Benedict quantitative solution.

TABLE I.

PERCENTAGE COMPOSITION OF ALKATAN LEAVES.

Constituent	*Dried Leaves*	*Calculated on Water-Free Basis*
Moisture	5.25	.....
Total Solids	94.75	100.00
Crude protein	7.82	8.25
Ether extract	4.50	4.75
Crude fiber	23.24	24.53
Reducing sugar as dextrose	6.49	6.85
Other nitrogen—free extractives	43.02	45.40
Total ash	9.68	10.22
Insoluble ash	7.29	7.69
Ash soluble in water	2.39	2.53

Tests for Alkaloids.

Tests for the presence of alkaloids were made by the procedure of Stas and Otto, as described by McGuigan,[4] using a 100 gram sample of the ground leaves. This procedure is essentially as follows: (1) Extraction of the mass, for thirty minutes beneath a reflux condenser, with three-fold its volume of boiling absolute alcohol acidified with tartaric acid, cooling, and filtration. (2) Evaporation of this filtrate to a syrup, treatment with water to precipitate resins, and filtration. (3) Evaporation of this filtrate to a syrup, treatment with absolute alcohol to precipitate proteins and dextrins, and filtration. (4) Removal of the alcohol from this filtrate by evaporation, and dilution of the residual liquid with water to a volume of 50 mils. (5) Extraction of the resulting clear solution with immiscible organic solvents in the order and under the conditions stated below: (a) Ethyl ether. (b) Ethyl ether in the presence of sodium hydroxide. (c) Ethyl ether in the presence of ammonia. (d) Chloroform in the presence of ammonia. After extraction (b), the aqueous solution was rendered acid by addition of sulphuric acid, then alkaline by addition of ammonia.

The organic solvent was evaporated from each of these four extracts at the temperature of the water bath. Each residue was dissolved in a small volume of distilled water; and aliquot portions of the resulting solution were tested for the presence of alkaloids by means of aqueous solutions of the following reagents: (a) Tannin. (b) Picric acid. (c) Potassium mercuric iodide. (d) Phosphotungstic acid. (e) Lugol reagent (iodine and potassium iodide).

Each reaction invariably yielded a negative result; therefore, alkaloids were not present.

Other Constituents.

Lipins. The amount of crude fat, obtained by extraction for sixteen hours in a Knorr apparatus, varied with the solvent used. The results are recorded in Table II. The petroleum ether had a boiling point of forty degrees to sixty degrees C.

TABLE II.

INFLUENCE OF SOLVENT ON YIELD OF CRUDE FAT.

Solvent	*Per cent. of Crude Fat in* *Dried Leaves*	*Total Solids*
Petroleum ether	4.37	4.61
Ethyl ether	4.50	4.75
Carbon tetrachloride	6.61	6.98
Chloroform	6.75	7.12
Carbon disulphide	8.05	8.50
Acetone	9.95	10.50

Oleoresin. In the procedure for the isolation of alkaloids, as described above, a resin fraction was obtained. This fraction contained a soft, black, balsamic oleoresin which was readily soluble in alcohol and in ethyl acetate, and still more soluble in ethyl ether.

Saponin. A 10-gram sample of the ground leaves was subjected to the procedure for the preparation of ammoniated glycyrrhizin.[5] A small quantity of a dark brown solid was obtained. This solid dissolved in distilled water. Addition of either dilute acetic acid or dilute sulphuric acid to this solution produced a precipitate which readily dissolved in dilute ammonia water. The precipitate was a saponin for its aqueous suspension foamed markedly on shaking, even when extremely dilute. Moreover, the suspension readily produced complete hemolysis of human erythrocytes. The aqueous solution of its ammonium derivative also possessed hemolytic properties, but to a lesser extent than did the free saponin.

Alkalinity of the Ash.—The soluble ash present in one gram of the dried leaves required 1.98 mils of 0.1 normal hydrochloric acid for its neutralization, while the insoluble ash required 6.70 mils. These results were recalculated for the total solids; the soluble ash present in 1 gram of total solids required 2.09 mils of 0.1 normal hydrochloric acid for its neutralization, while the insoluble ash required 7.07 mils. Methyl orange was used as an indicator in these titrations.

Biological Test for Vitamines.

This test was made by Albert B. Katz and Horace L. Weinstock under the personal supervision of the senior author. Five growing albino rats, litter-mates, two males and three females, were fed a vitamine-free diet during a preliminary period of forty days. The ration contained: vitamine-free casein 18 per cent., starch 54 per cent., mixture of salts 4 per cent., hydrogenated vegetable fat 24 per cent. The salt mixture supplied the calcium, magnesium, sodium, potassium, and ferric cations, and the sulphate, phosphate, chloride, citrate and lactate anions. The sexes were segregated. Each rat first gained, then decreased in body weight. This decrease showed the absence of growth-promoting vitamines from the diet.

Then the rats were fed the vitamine-free ration, modified by addition of 10 per cent. by weight of ground alkatan leaves, for a test period of eight days, during which they experienced further progressive decreases in body weight, the minimum weight being attained at the end of the eighth day. The body weights, in grams, of each rat at the beginning and the end of this period were: No. 1 male 86.5 and 73.5, No. 2 male 79.1 and 71.8, No. 3 female 52.2 and 41.9, No. 4 female 68.6 and 60.9, No. 5 female 57.0 and 48.7, respectively.

However, the per capita consumption of food decreased during the test period. The average daily food consumption, in grams, per rat was: Males, during preliminary period, 7.2; during test period 2.9; females, during preliminary period 5.7, during test period 3.2.

The loss in body weight during the test period may have been due either to lack of growth-promoting vitamines in the diet, or to decreased ingestion of food rendered unpalatable by the alkatan. Therefore, no definite conclusion can be drawn concerning the presence or absence of vitamines in alkatan.

Summary.

The gross composition of alkatan leaves has been studied. Alkaloids are absent; an oleoresin and a saponin are present; no definite conclusions can be drawn concerning the presence or absence of growth-promoting vitamines.

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SOME STUDIES ON THE SO-CALLED "WESTERN" (SOUTH DAKOTA) OIL OF AMERICAN WORMSEED.

I. A Preliminary Note as Suggested by the Results of the 1923 Investigations.

By Anton Hogstad, Jr., P. C., M. S.

A study of the American wormseed (*Chenopodium ambrosioides* var. *anthelminticum*) problem was entered upon by the Division of Pharmacy, South Dakota State College, some four years ago, in connection with the work of the Medicinal and Poisonous Plant Investigations Gardens. The American wormseed problem is one of vital importance and significance to the State of South Dakota, this State being primarily of an agricultural nature. In this connection, the Division of Pharmacy is being aided in their investigations by the Division of Agriculture of the same institution, in the investigations dealing with the problem of anthelmintic medication.

The Division of Pharmacy plans to make a thorough study of this question, touching upon such phases of the work as cultivation and distillation problems, phyto-chemical research, anthelmintic medication, pharmacognostical studies, etc.

It is the purpose of this paper to briefly review some of the facts as presented by the 1923 investigations, and which tend to throw considerable light upon the problem of distillation, as well as that of phyto-chemical studies. From the results obtained by other investigators, as well as by the writer, it is apparent that there are

many factors that have to be taken into consideration in order to secure an oil that will comply with the standards as set forth in the "United States Pharmacopœia."

A Single Mature Plant of Chenopodium ambrosioides var. anthelminticum, Which is Typical of the Luxuriant Growth Possible in Fertile South Dakota Soil.

This is due for the most part owing to the peculiar nature of the supposed active constituent of the oil, namely, that of ascaridol, which, it has been noted, is subject to a very marked change during the course of distillation of the herb.

The investigations of 1923 were based upon four or five thousand pounds of herb, while that of the 1924 investigations will be

conducted on a much larger quantity of herb. Some two acres of herb were placed under cultivation for the 1924 season, the materials to be used in an attempt to substantiate the findings for 1923.

General Method of Distillation.

The type of still as utilized for the 1923 distillations was that of one adopted through course of necessity, but which apparently served the purpose quite well. It was that of a large autoclave, capable of receiving a charge ranging from 125 to 150 pounds of herb. As stated, this type of still was adopted through course of necessity, due to the exploding of a large galvanized iron still which had been constructed especially for American wormseed distilla-

FROM FIELD TO STILL.

The Herb After Being Hauled to the Still, Was Trimmed by Means of Large Knives, in Order to Separate the Flowering or Fruiting Tops, From the Woody Basal Portions, Especially the Basal Portion of the Main Stalk.

tions, at which time the writer narrowly escaped serious injury. The explosion was caused by the packing of the hot herb in the still, after the steam had been shut off, which was necessitated by a leak in the condenser. Shortly after the steam pressure was again resumed, the still opened with considerable force, expelling the contents of herb and live steam, in close proximity to that of the writer.

The investigations for 1924 will be conducted by means of a 250-gallon, half-inch boiler plate steel, vertical type of still, and which will be provided with all necessary safety appliances.

The type of condenser was that of a wooden box, twelve inches square and fourteen feet in length, through which passed four one-inch pipes. The latter, that of the four pipes, were connected to the main line from the still by means of a distributor, to assure as far as possible a uniform distribution of the vapors. The distillate was collected in two one-gallon bottles, the oil being separated from the water by means of one-gallon funnels, provided with cork stoppers to which were attached wooden rods. Distillation as a general rule proceeded under a pressure of ten pounds per square inch, the time of distillation ranging from fifteen to twenty-five minutes, twenty minutes, or thereabouts, having been found to be the most suitable for practical purposes.

Partial Summary of 1923 Investigations.

Several interesting results were obtained from the investigations of the 1923 period, which are tabulated as follows:

Laboratory No.	Type of Herb	S. g. 25° C.	*Ascaridol Content Percentage	Solubility 8 Vols. 70% Alcohol	$ND_{20}°$	αD_{25} (100 mm. Tube)	Time of Distillation (Minutes)
1A	Flowering	0.8547	10	Insoluble	1.4760	—12.03396	11
1B	"	....	6	"	1.4770	—11.61780	15
2A	"	0.8487	6	"	1.4760	—11.89524	10
2B	"	....	6	"	1.4770	—11.61780	15
3A	"	0.8663	6	"	1.4755	—12.20736	15
3B	"	....	6	"	1.4765	—12.31140	20
4	Partially Mature	0.8671	10	"	1.4750	—12.45212	25
5	"	0.8503	6	"	1.4750	—11.79120	12
6	"	0.8847	20	"	1.4740	—12.72756	18
7	"	0.8869	20	"	1.4742	—13.17840	15
11	Mature	0.9605	50	Soluble	1.4740	—8.87808	18
12	"	0.9629	51	"	1.4740	—8.08044	20
13	"	0.9665	56	"	1.4740	—7.90704	20
14	"	0.9687	56	"	1.4732	—7.07472	20

*E. K. Nelson: "Rapid Method for Determination of Ascaridol in Oil of Chenopodium." *Jour Amer. Pharm. Assoc.*, Vol. X, No. 11, November, 1921.

Samples 1A, 1B. 2A. 2B, and 3A and 3B, represent fractional lots of three respective batches of herb.

Examination of the above tabulation of results shows first of all that a so-called type of "Western" oil of American wormseed was secured (Nos. 11-12-13-14), which complied in every respect with the requirement of the "United States Pharmacopœia." Another interesting result obtained is that the oil from the flowering plants was very low in ascaridol content, while that from the partially mature plants being considerably higher and that from the fully matured plants still greater in ascaridol content. It is interesting to note the changes in the physical constants from the time of flowering to that of the period of maturation. With the increase in ascaridol content, there is a corresponding increase in the specific gravity of the various samples of oil. It may be said at this time, that the distillations were not conducted merely on three different days, one for the flowering, one for the partially mature plants, etc., but were conducted at various intervals from the time of flowering to the period of maturation.

The requirement as to solubility in eight volumes of 70 per cent. alcohol is also interesting, in that only the samples of high ascaridol content were soluble in the stated medium. The results as to optical rotation and refractive index are also quite interesting and which tend to throw some light on the changes in the oil from the time of the flowering plant to the period of maturity.

Development of a New Theory in Connection with the Problem of Distillation.

If the above results can be checked or substantiated in some degree or other by the 1924 investigations, then it appears as though additional light is to be thrown on the problem of distillation of American wormseed, and that it is not only a question of the mechanical factors involved in the process of distillation.

The above thought involved in the theory, that of distilling the flowering plants, was obtained from a suggestion made by Wirth,[1] which, quoting the author verbatim, is as follows:

> "It would be an interesting experiment which might bring to light some important facts, to distil the oil from the plants in the flowering stage. Such an experiment would at least tend to show whether the cymene present in the oil distilled from the fruits, was originally present or was formed as a decomposi-

[1] *Jour. Amer. Pharm. Assoc.*, IX: 135, 1920.

tion product of the ascaridol, upon development of the fruit. There is, of course, the possibility that the oil from the flowers has a much higher ascaridol content than that distilled from the plant at a later period. If this is true an important error lies in the time of distillation; in fact, none of the work upon the distillation of plant products should be conducted without a previous knowledge of the changes in structure of the ovary, and constituents of the oil, until the time of maturity of the fruit."

The investigations of the writer tend to throw some light on the question of the ascaridol and cymene constituency of the oil, in that, in all probability, the ascaridol is formed from the cymene, and not the reverse as suggested by Wirth, that the cymene is formed from the decomposition of the ascaridol. Fractional distillation experiments under reduced pressure on the 1923 oils substantiates the findings of the Nelson rapid method for ascaridol determinations, in that the oil from the flowering plants had a very high percentage of p-cymene and with a corresponding low content of ascaridol. In the case of the oil from the mature plants, the results were just the reverse.

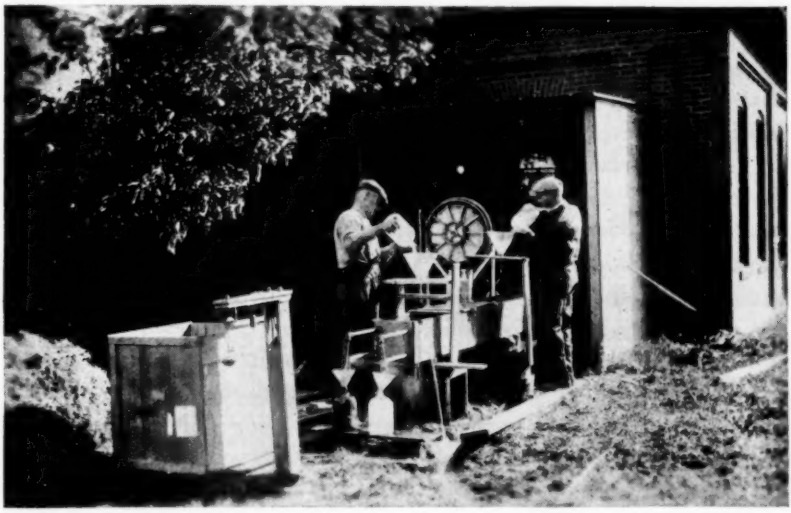
The results then show that the distillations should be conducted upon mature plants, or at some period of maturation, whereby a standard oil can be secured. It will be interesting to check the results of the 1923 investigations by a series of distillations over stated periods of time, to note at which time a standard oil can be secured. The results also substantiate the suggestion made by Wirth that the distillation of plant products should not be conducted without a previous knowledge of the changes in the structure of various plant organs, constituents of the oil, until the time of maturity.

Phyto-Chemical Considerations.

In addition to throwing considerable light upon the distillation problem, the results of the 1923 investigations also tend to shed some light on the phyto-chemical principles involved in a study of the oil of American wormseed. A purely speculative consideration of the problem based upon the results as secured by the writer, suggests several avenues of approach in a phyto-chemical study of this plant.

If it be true that ascaridol is formed from cymene, and that cymene is not formed as a decomposition product of ascaridol, then it may be possible, yet highly improbable, that one can effect a syn-

thesis of ascaridol or an ascaridol-like compound, through the agency of p-cymene or some similar organic compound. Although this may be found possible at some future period by some investigator or other, there are several things that have to be taken into consideration before such a synthesis can be effected. One is that of the peculiar oxygenated linkage of the ascaridol as well as the double-bonded linkage, both of which present serious difficulties. In regard to the latter, that of the double-bonded linkage of the ascaridol molecule, the question of stereochemistry comes into play, for one can readily see that isomerism would play a very important part, by the possible re-arrangement of the two oxygen atoms.



DISTILLATION OF AMERICAN WORMSEED HERB.

Showing Autoclave Type of Still; 4-pipe Wooden Box Condenser; Method of Weighing Herb and Method of Separation of Oil and Water by Means of 1-gallon Funnels Provided With Cork Stoppers Attached to Wooden Rods.

Of course it is to be understood that it is not simply a question of the cymene and ascaridol constituency which would have to be taken into consideration, but the other constituents as well, such as have been found by other investigators, *viz.*, sylvestrene, d-camphor, etc.

A phyto-chemical survey of this and similar problems again brings one to the closed door of phyto-chemical research, and the oft-repeated question again presents itself: "How does the plant accomplish such marvelous chemical syntheses, and apparently with

considerable ease, when man on the other hand, with his modern facilities for phyto-chemical study, is baffled and outwitted at every point in this fertile field of scientific investigation?"

PHARMACOGNOSY LABORATORY SOUTH DAKOTA STATE COLLEGE, DIVISION OF PHARMACY.

SOME PHYSICO-CHEMICAL PROPERTIES OF STARCH—II.

By Ellery H. Harvey,

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Hygroscopicity: It is well known that starch changes in weight during storage. The rapidity with which this change takes place depends on several variables, including the moisture content of the original material, the humidity of the atmosphere, the nature of the container, the surface exposed, the temperature, extent of circulation, etc. In this series of tests the conditions were arbitrarily chosen and maintained during a period of fifteen days. The tabulated results indicate that the change in hygroscopic moisture is not uniform but changes rapidly during the first two or three days, and then proceeds very slowly except corn and cassava with a moisture content of 10-11 per cent.; these change very little in weight when exposed to an atmosphere having a relative humidity of about 35 per cent.

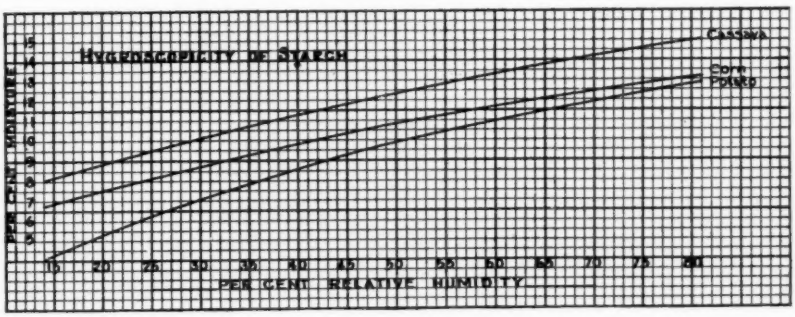
The method consisted in exposing 5 gram samples, held in 3-inch porcelain evaporating dishes, to an atmosphere of definite humidity and under constant temperature, for a period of fifteen days, the change in weight being recorded every twenty-four hours. Such a condition was brought about by preparing sulphuric acid solutions of various strengths, placing in the bottom of large desiccators and holding the samples in the sealed atmospheres above the liquid. Knowing the percentage of sulphuric acid in the solution, the vapor pressure was ascertained by reference to Regnault's table.[9] Such vapor pressure readings are converted to relative humidity by reference to Fowle.[10]

[9] *Chemiker Kalender* (1922), Vol. 2, page 135.
[10] *Smithsonian Tables* 190 (1921).

Days

Starch	*% Humidity*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Cassava	14	9.40	9.06	8.91	8.85	8.78	8.73	8.67	8.59
Cassava	34	11.03	10.98	10.94	10.87	10.81	10.76	10.73	10.71
Cassava	81	14.45	14.64	14.74	14.84	14.89	14.94	14.97	15.01
Corn	14	8.14	7.59	7.50	7.42	7.34	7.27	7.21	7.13
Corn	34	10.12	9.90	9.73	9.61	9.51	9.48	9.45	9.41
Corn	81	12.43	12.98	13.16	13.18	13.19	13.20	13.21	13.22
Potato	14	6.53	5.57	5.25	5.09	5.00	4.93	4.81	4.70
Potato	34	9.31	8.88	8.53	8.34	8.21	8.11	8.06	8.00
Potato	81	12.50	12.82	12.88	12.89	12.90	12.91	12.92	12.92

Starch	*% Humidity*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
Cassava	14	8.50	8.43	8.35	8.26	8.20	8.15	8.09
Cassava	34	10.69	10.66	10.64	10.62	10.60	10.58	10.57
Cassava	81	15.04	15.07	15.10	15.14	15.18	15.21	15.24
Corn	14	7.06	7.00	6.92	6.85	6.80	6.75	6.71
Corn	34	9.37	9.34	9.31	9.28	9.26	9.24	9.22
Corn	81	13.23	13.24	13.25	13.26	13.26	13.26	13.26
Potato	14	4.62	4.52	4.43	4.34	4.26	4.17	4.09
Potato	34	7.95	7.89	7.83	7.77	7.71	7.66	7.62
Potato	81	12.93	12.93	12.93	12.93	12.93	12.93	12.93



The statement is frequently made in the literature that bone-dry starch is very hygroscopic, without any data being given. The following represents the results obtained in an effort to determine how rapidly perfectly dry cassava starch, under given conditions, adsorbs moisture from air of known humidity and temperature.

Cassava starch was dried to constant weight and six grams of it contained in an evaporating dish exposed on an analytical balance, the temperature being 25 C and the relative humidity 57.5

per cent. The increase in weight at stated intervals indicates that the adsorption is relatively rapid at first and gradually slows down.

Time	*% Moisture*
Initial	0.000
15 minutes later	0.117
30 " "	0.235
45 " "	0.285
60 " "	0.330
1¼ hours later	0.363
1½ " "	0.401
1¾ " "	0.420
2 " "	0.455
2¼ " "	0.491
2½ " "	0.510
2¾ " "	0.541
3 " "	0.580
3½ " "	0.652
4 " "	0.727
4½ " "	0.803
5 " "	0.910

Viscosity: An Ostwald apparatus was used in making these measurements, the instrument being calibrated with distilled water. The temperature was controlled by suspending the instrument in a thermostat and the number of seconds taken with a stop-watch. The results given below represent relative viscosity, *i. e.*

$$\frac{(\text{time x density}) \text{ of starch sol.}}{(\text{time x density}) \text{ of water}}$$

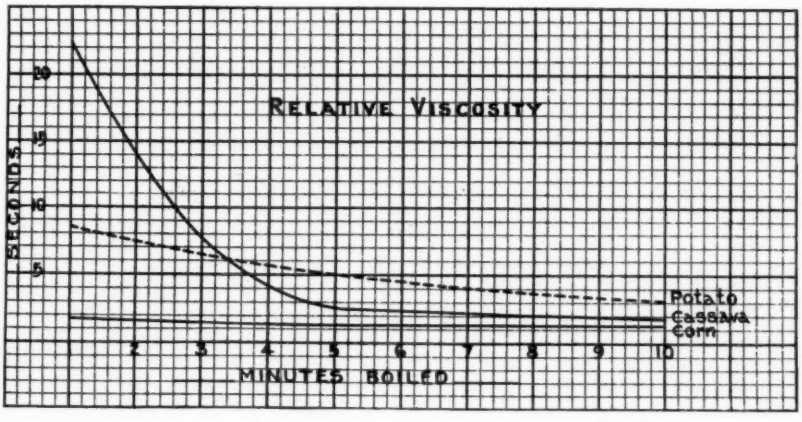
The starch was suspended in distilled water and shaken until a uniform suspension was obtained. This was poured into a vacuum bottle and live steam run directly into the liquid. The boiling was as brisk as possible without throwing any of the material from the bottle. Condensation was kept at a minimum by using high pressure steam and well insulated pipe lines.

From the table and curves it is evident that cassava starch starts out with a high viscosity and drops rapidly during the first five minutes, the minimum thus attained not being appreciably lowered during the remaining five minutes. On the other hand corn starch does not change materially during the entire ten minutes. Potato starch starts in an intermediate position and ends with a viscosity higher than either of the other two. This data has considerable significance in the proper use of various starches where viscosity is of importance.

EFFECT OF LENGTH OF TIME OF BOILING ON THE VISCOSITY OF 4.75% STARCH SOLUTIONS PREPARED BY BOILING WITH LIVE STEAM.

Temp. 95 C.

Cassava:										
Minutes Boiled	1	2	3	4	5	6	7	8	9	10
Viscosity	22.05	14.01	7.5	4.3	2.7	2.5	2.3	2.1	2.0	1.8
Corn:										
Minutes Boiled	1	2	3	4	5	6	7	8	9	10
Viscosity	1.75	1.68	1.62	1.56	..	..	..	..	..	1.56
Potato:										
Minutes Boiled	1	2	3	4	5	6	7	8	9	10
Viscosity	8.3	7.5	6.5	5.6	5.0	4.5	4.0	3.7	3.4	3.1



Surface Tension: Surface tension measurements of substances in the colloidal condition, using the customary methods, are unre-

liable. While rather difficult to control the temperature and to prevent evaporation, the du Nouy Tensimeter [11] is the most convenient and accurate of present methods for the determination of this important constant on colloidal systems.

The method consists in bringing a 4cm. circumference platinum ring into contact with the surface of the liquid to be tested and then by means of a torsion balance the ring is pulled away from the liquid. The weight in grams necessary to bring the ring back into contact with the liquid is a measure of the tension necessary to break the liquid film. Since this procedure is time consuming, the ring is calibrated with distilled water and a factor applied to the dial readings. We may assume that the strain on the wire is proportional to the angle of torsion, therefore

$$\text{S. T.} = \text{M. g} \,/\, 2\text{C}$$

where

M = mass in grams necessary to tear the film,
g = 981
C = Circumference in cm. of ring

In order to obtain consistent results the following points must be controlled: the temperature, since surface tension is a function of it; all vessels and the ring must be chemically clean; vibration must be absent; the surface of any but pure liquids must be renewed; evaporation must be prevented.

The starch solutions were prepared by suspending the required amount in distilled water, boiling five minutes, making up evaporation losses and cooling to the temperature in a covered vessel.

Temp. C.	*Surface Tension in dynes of 1% cassava starch*	*Surface Tension in dynes of 2% cassava starch*	*Surface Tension in dynes of 3% cassava starch*
70	54.53	63.84	67.16
60	62.51	67.16	68.49
50	69.16	70.48	69.82
40	71.48	71.81	71.15
30	73.15	73.15	72.48
20	74.48	74.15	73.81

[11] du Nouy: *Jour. Gen. Physiology*, May 20, 1919 (Vol. 1, No. 5).

Temp. C.	*Surface Tension in dynes of 1% corn starch*	*Surface Tension in dynes of 2% corn starch*	*Surface Tension in dynes of 3% corn starch*
70	46.55	50.54	61.84
60	55.19	57.85	65.83
50	63.17	63.17	67.83
40	69.16	67.16	69.82
30	73.15	70.48	71.48
20	74.48	72.48	73.15

Temp. C.	*Surface Tension in dynes of 1% potato Starch*	*Surface Tension in dynes of 2% potato starch*
70	67.50	68.25
60	69.25	69.82
50	71.00	71.15
40	72.50	72.81
30	74.13	74.48
20	75.13	75.80

For comparison, the surface tension of distilled water is given below. It is to be noted that the relationship of temperature to surface tension is practically a straight line, in this instance; that the results given by the ring method are slightly higher than those obtained by other methods; that starch in the colloidal condition tends to increase the surface tension of water.

Surface Tension of Distilled Water.

Temperature °C.	*Dynes per cm.*	*Temperature °C.*	*Dynes per cm.*
5	77.86	45	70.31
15	75.97	55	68.25
25	74.26	65	66.19
35	72.37	75	63.79

Specific Gravity of Cassava Starch Suspensions:

The table below represents determinations made on cassava starch having a moisture content of 11.06 per cent., using distilled water at 18 C.

% of Cassava Starch in the Suspension	*Specific Gravity at 18 C.*	*% of Cassava Starch in the Suspension*	*Specific Gravity at 18 C.*
1	1.0034	14	1.0476
2	1.0068	15	1.0510
3	1.0102	16	1.0544
4	1.0136	17	1.0578
5	1.0170	18	1.0612
6	1.0204	19	1.0646
7	1.0238	20	1.0680
8	1.0272	21	1.0714
9	1.0306	22	1.0748
10	1.0340	23	1.0782
11	1.0374	24	1.0816
12	1.0408	25	1.0850
13	1.0442		

Acknowledgment:

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Summary:

Physico-chemical data, sufficient to characterize average raw commercial starch of good grade, have been presented. Each series of determinations have been made on the same sample with the idea of increasing the significance of the results presented.

WHAT IS A POISON?

Henry Leffmann, A. M., M. D.

Every toxicologist, pharmacologist, physiologist and physiologic chemist has probably at some time or other had this question posed? A great many answers verbal and written have been given, but none has yet been offered which will stand skillful cross-examination. The truth is that every substance that is capable of being

absorbed by the fluids of the body, may act as a poison if in sufficient dose, and any substance though, like the "juice of cursed hebenon . . . . Holds such an enmity with the blood of man," may, if, in minute dose, be without appreciable effect. Toxicologists have, I think, generally held that in order that a substance may be classified definitely as a poison, it should be capable of absorption into the circulation. Powdered glass may produce death, but its action would be generally considered as traumatism and not poisoning. In trials for poisoning it is usually incumbent upon the prosecution to show that some tissue or viscus has absorbed the poison or some element of it. In cases of arsenical poisoning of the ordinary type, it is almost always possible to find appreciable amounts of the arsenous oxide undissolved on the inner wall of the stomach. Such remainder has much value as indicating the form in which the poison was ingested, and the exhibition of the material will have a profound effect upon the court and jury, yet as a matter of fact this portion is the arsenic which has not caused death, for it has not been absorbed.

When we pass from the records of toxicology, replete with instances of the use of powerful substances in full doses and, therefore, giving rise to symptoms of vivid and unmistakable type, followed by chemical analysis showing the elements of compounds foreign to the normal tissues, and, therefore, specific introductions —when we pass, I say—from such definite data to the results of experimentation on the lower animals, we encounter sources of error that require to be carefully discriminated. I do not wish to be understood as deprecating the results of the laboratories of Pharmacology or Experimental Physiology. They have their legitimate function, and their work has yielded a vast amount of useful data, but I protest that much also has been put forth that is seriously misleading.

Thought upon this subject has been especially quickened in my mind by the statements lately made quite freely concerning the effects of the accessory ingredients present in alcoholic beverages. Pure alcohol, like pure water is a specific product of the laboratory, difficult to obtain and difficult to preserve. In the vast majority of cases in which these substances are used, absolute purity is not expected. The consequence is that effects of the ingestion of water or alcohol will be influenced by the accessory ingre-

dients. The importance of determining the ingredients of water is fully recognized; an extensive literature exists upon the subject, and the methods of water analysis have been brought to a high degree of efficiency and convenience. The corresponding study of the effects of the ingredients associated with alcohol in common beverages has not attracted as much attention, yet alcoholic beverages are extensively used (even in prohibition America) and have been largely used throughout the recorded history of the world. The reason for this difference is easy to find. Water in itself when used in such amounts as respond to the normal desires of the organism exerts no injurious action, but the accessory ingredients may produce serious results. Distilled water containing a minute amount of a lead compound will serve the physiologic purposes of water just as well as if it was pure, but will add an accessory action that will soon give rise to disturbed function. The water-analyst, and the sanitary engineer, therefore, give no care to the water in itself, but to the substances in solution and suspension. With alcoholic beverages, however, the situation is in almost all cases reversed. The dominant ingredient is the solvent not the substances in solution, that is, the alcohol and not its associated ingredients whether present through natural processes or added intentionally or incidentally.

Since the adoption of the Eighteenth Amendment and the passage of the Volstead Act, an extensive literature has been developed concerning the so-called "poison rum." The subject is really not new, it is only newly exploited in great extent. More than half a century ago, when the organizations known as "Cadets" and "Sons of Temperance" began an active propaganda against the sale of alcoholic beverages, it was a common shibboleth to defend by claiming that if liquors could be obtained "pure," the evils of drunkenness would disappear. Much earlier, in fact, in ancient times, the claim was made that fresh liquors are more or less poisonous and that a certain amount of "ageing" is required to fit them for use. In the phraseology of today, this requirement seems to be limited to distilled liquors. It is not usually applied to malt liquors and wines. Yet in ancient times there seems to have been a general view that freshly made wine was especially intoxicating, for in the Pentecost scene in Acts, the scoffers in the crowd that were listening to the Apostles speaking in "other tongues," said, "Behold they are filled with new wine." However, this quotation

is of uncertain value, as the Greek word translated "new wine" in our standard text is "gleukos," the exact meaning of which may not be known. To translate by "must," which means the unfermented juice of the grape will not suffice, as it is beyond the bounds of possibility than any one could become intoxicated on fresh grape juice.

For many years it was universally admitted and taught by chemists and physiologists that freshly distilled liquors contain markedly injurious substances, that are removed or sufficiently modified by ageing, so that the liquor becomes safe. The ingredient concerning which this shibboleth was almost always connected was the complex of higher alcohols, collectively known as "fusel oil." A dominant ingredient in this complex is the group of amyl alcohols, and a pretty theory was current that by the ageing, these alcohols were converted into a fragrant and harmless ester, amyl valerianate. This view dominated the minds of doctors and chemists for many years, but received its death blow in 1908, when Crampton and Tolman published the results of their long and careful study of the ageing of spirits, and showed that the fusel oil does not diminish appreciably during long storage, and that the color and aroma of the aged liquor is due to materials dissolved from the charred surface of the cask. Crampton and Tolman also showed that the other accessory ingredients in spirits, such as acids, esters, and acetaldehyde are not appreciably diminished by storage.

In a report upon the examination of about 75,000 samples of illicit spirits, made by Doran and Beyer of the Prohibition Division of the United States Internal Revenue Department, no instance of marked excess of any of the accessory ingredients normal to such spirits was found, as compared with Crampton and Tolman's results on thoroughly aged liquors, except acetaldehyde, and the authors of the communication take up the question as to the specific poisonous character of this ingredient. The data are, unfortunately, of the flimsiest type. As usual with physiologic experimentation of this type, comparatively large doses of acetaldehyde were given to rabbits. Functional and visceral changes were observed. The animals were also compelled to inhale the vapor for considerable periods. The latter experiments are wholly worthless as bearing on the effect of the ingested substance. The experiments by ingestion do not have any useful bearing, as the doses

were large and aldehyde was not given in association with a large amount of alcohol as would always be the case with whiskey. Doran and Beyer also quote Holland's "Chemistry," but the statement is merely a secondary one, that is, no authority is given and it seems to be merely a repetition of the old fetish about the dangers of raw whiskey which has circulated about Jefferson Medical College (of which Dr. Holland was a graduate and a professor) for about half a century, based on views that have been entirely upset by the Crampton and Tolman investigations.

In the early days of prohibition enforcement, especially when it was matter of individual state laws, a poisonous adulteration of drugs (tinctures) and liquors occurred. This was the addition of methanol either directly as a substitute for grain alcohol or as ingredient in denatured alcohol, which had been partially purified and sold for genuine spirit. Blindness and death were noted as results of such adulteration, and it undoubtedly constituted a "poison rum" problem. Statistics and reports from public laboratories at present seem to show an almost complete absence of this impurity. Messrs. Howard, of New Hampshire, Lythgoe, of Massachusetts; Bailey, of Connecticut, state chemists of large experience, advise me that methanol is rarely found. Dr. Edel, of Newark, New Jersey, gives figures which are very suggestive. Probably the wide dissemination of the highly poisonous character of methanol had much to do with its abandonment, but I think another condition, which will be later noted, has had a more potent influence.

Dr. Edel has examined during the last four years about 8000 samples. The analyses show progressive variation. First, methanol was common, then acetone, then cinchona alkaloids, and now-a-days, diethyl phthalate. Toxicologic examinations were also made in number of cases, and the results also show the change in regard to methanol.

Year	*Methanol poisoning*	*Alcoholism proper*
1920	40	3
1921	23	11
1922	14	18
1923	3	15
1924 to date	none	large increase

Dr. Robinson, Philadelphia city chemist, has stated that of late almost no samples containing methanol have come under his notice, and he has had a large experience. This is also the experience of the Dr. LaWall. Diethyl phthalate is now found in many cases in illicit spirits. This must be due to the permission given by the Government for the use of a "rubbing alcohol" denatured only with this ingredient. The formula calls for 2½ per cent. of diethyl phthalate to strong alcohol, as the ester is but sparingly soluble in the dilute. This denaturant can be removed by comparatively simple and inexpensive methods, and as a brand of rubbing alcohol with 92.5 per cent. of alcohol is purchasable at retail at seventy-five cents per pint (out of which about three pints of 30 per cent. spirit could be made) it is, I think, easily seen why acetone, methanol and some other denaturants are now not commonly encountered by chemists, but traces of diethyl phthalate are frequent.

Notwithstanding the results of Crampton and Tolman quoted above, a general opinion exists that distilled spirits are specifically injurious unless the first and last portions of the distillate are excluded and the liquor has been preserved for some years in charred casks. Is there any clinical or physiologic evidence for this, or is it merely a fetish such as that fresh bread is unwholesome or meat should not be eaten while the animal heat is in it?

The limited list of experiments to determine the physiologic effects of accessory ingredients in liquors is permeated with a fundamental error, in that these substances are studied separately, while actually they are ingested in association with large proportions of alcohol. A recent investigation of diethyl phthalate exhibits this defect markedly. Otto M. Smith, of the Iowa State College, communicates to the *Journal of American Pharmaceutical Association* (1924, *13*, 812) a short paper giving results of experiments on rats and chickens. He administered very large doses, in some cases 1.5 per cent. of the body-weight. Curiously enough, while he found severe symptoms to arise in all the cases, he registers an opinion that the ester is not "toxic to animals and probably not to man." Both views are wholly unacceptable. He seems to regard "toxic" as meaning "fatal." Apart from this error in the conclusion, it is to be noted that to determine the effects of dietyl phthalate as it occurs in recovered alcohol, the study should be made on such samples and

not on the pure substance. Diethyl phthalate is but feebly soluble in water, hence if given alone it may act only as a local irritant, somewhat similar to chloroform, but when in solution in strong alcohol it will be much more likely to pass into the tissues of the digestive organs with that diffusible stimulant.

The same criticism applies to the pharmacologic tests of acetaldehyde quoted by Doran and Beyer as noted above. The largest proportion of aldehyde reported by Doran and Beyer is one part in 1000, closely approximate to 1 cc. to 1000 c. or say about half a thimbleful to the quart. This sample contained 77 per cent. of alcohol. If any one should drink a few ounces of this liquor and be "knocked out," to use the common phrase, it would be the height of absurdity to ascribe such effect to the aldehyde. The aldehyde, even assigning to it a much higher toxicity than the recorded experiments indicate (as far as they indicate anything positive) would be without appreciable effect compared with the alcohol present.

ABSTRACTED AND REPRINTED ARTICLES

CHEMISTRY AS A SOURCE OF NEW WEALTH.†

By Ivor Griffith, Ph. M.

Take interest, I implore you, in those sacred dwellings which one designates by the expressive term: Laboratories. Demand that they be multiplied, that they be adorned: these are the temples of the future—temples of well-being and of happiness. There it is that humanity grows greater, stronger, better.

LOUIS PASTEUR.

Chemistry is the keystone science. It is the cardinal creative science. The earth and all above, upon and below its surface is built of the ninety odd chemical elements, and their multifarious combinations. Subtract these elements and their compounds from the universe as we know it—and there is nothing left. Our con-

†Reprinted from *The Annals of the American Academy of Political and Social Science.*

scious beings, and our unconscious environment, are made of the same material. Thus we note the fundamentality of chemistry.

But we cannot ignore, in this connection, another equally fundamental science—namely: Physics. Together these sister sciences—branches of the all-important doctrine of matter and energy—are the substructure whereupon rests all the other sciences. Chemistry is our substance, and chemistry and physics control our very lives. Each breath—each thought—each pulsing heart throb—are in their certain jurisdiction.

But despite this all-importance of chemistry, man has but recently come to peer beyond its bounding fringes—and only then because of forced interest. The transient modes of life—the swiftly changing problems of his earthly tenantry have urged him more and more to the intimate study of this inexhaustible science. And as scurrying time builds up its scheme of centuries man will continue to extract from this prolific source wonders and wonders that shall reach beyond his wildest expectations.

"Yet all these were, when no Man did them know,
Yet have from wisest Ages hidden beene;
And later Times things more unknown shall show.
Why then should witlesse Man so much misweene,
That nothing is, but that which he hath seene."

The Trail of Chemical Progress.

Indeed in chemistry the accomplishments of yesterday dissolve without a trace into the vastnesses of tomorrow's possibilities. Yet we cannot belittle overmuch these accomplishments of other years, for it was an early chemical discovery that carved the first deep line of difference between man the time binder, and beast the space binder. This was out in the primeval timberland when man by accident came upon that chemical force called fire. This may be truly called the primary "epoch-making discovery"—and the cycles of human progress have ever followed in the wake of such discoveries of chemical things and chemical forces.

This fire agency was forthwith put to work in the extraction of the then noble metals from their respective ores. Thus was heralded first the age of bronze.

Born of fire next came iron—possibly the master creation of the crude chemist of the past. Tools of chipped stone, crude in

their conception and cruder still in use, gave way to sharper blades of bronze, and then iron and tempered steel. The empiricism of the blunt stone chisel changed to the knife edge precision of instruments built of steel. And consonant with the change in tools came a like change in the thoughts and ideals of man. The blunt mentality of the cave men keened itself in the temper of the times to the philosophic sharpness of the later age thinkers. Better tools meant better tasks, and better tasks meant brisker thinking.

Brisker thinking soon realized that systematic study of the natural sciences would bring to light still greater things. Thus the abstract philosophies of Athens and the flighty hypotheses of the dreaming alchemists, who sought the impossible though often stumbling upon the profitable, gave way to the methodical researches of a new group of learned men. These men studied carefully the fundamental chemical and physical laws so that with their understanding useful discoveries would in time become more common. They would be incidents, not accidents.

Through the efforts of such men as Bacon, Huxley, Dalton, Lavoisier, Mendeléeff and many other inveterate workers in the realm of pure science—there dawned upon the world a new light.

Like the beams of a superlative searchlight tearing apart the night, came finally the realization of the importance of this science of chemistry in its manifold bearings on life and on the living. But it had taken the world a tedious span of time to recognize the practical values of this great science. Not indeed until the commencement of the 19th century did it become well established as a most important factor in shaping the destinies of men and nations. Since then its progress has been in leaps and bounds.

The trail of chemical progress through the centuries followed step by step with slow convincing tread. It led from the idea of the chemical element to the isolation of the then important elements, the establishment of the quantitative laws of chemical combination, the application of the atomic theory to explain chemical reactions, and of the idea of valency, to molecular constitution and structure, and thence to the study of the intimate constitution and property of the atom. Today although "the trail is still awinding" no one can foretell its ultimate destination.

There is no end to its promises; there is none of its promises that may not be fulfilled. Much has been discovered, but there is

an uncharted domain yet untouched whose boundaries are too wide for conception. Nor can we penetrate this vastness by sheer imagination. For in chemistry dreamers seldom get ahead. Sir William Pope in a recent lecture expressed the following sentiment:

> "All inquiring minds in science are accustomed to peer into the future in an attempt to discern the directions in which progress is possible; hundreds of imaginative writers have tried to foretell the effects upon human life which will accrue from coming advances in science. In this connection I desire to submit one ruling principle—a principle which is admirably exemplified by the directions of progress during the present century and which appears to be as yet but ill recognized. The principle is that all scientific prophecy which goes outside what will obviously and logically result from the normal and unsensational development of the existing scientific position is necessarily false. No one in 1900 ever conceived anything so sublime and yet so fantastic as the achievements of the past quarter of a century.

"Chemistry as a Source of New Wealth" opens then a fertile field for pert conjectures. But only with chords already sounded is it well for us today to tune our prophetic symphony. The painful deductions made by careful observers of experimental facts are at our disposal, and we can sense much of their meaning. Our wide outlook gives us a chance to safely predicate the future.

Let us briefly inquire into the relations between chemistry and industry.

Chemistry Points Road to Conservation.

In this connection the outstanding theme of the current generation is the speculation concerning the depletion of its known storehouses of energy. The whirling progress of the present, so alarmists state, is consuming its capital of resources. The world is being impoverished and posterity embarrassed by the lavishness of the current generation, in its expenditure of coal and petroleum residues.

To the scientist, however, this gives but little concern. He knows that posterity will not be long embarrassed, for with the insight already gained into energy changes of reacting chemicals, and the possibilities of growing our motive fuel as we grow our body food fuel—new sources of energy will have been found long

before our natural resources shall have been exhausted. Posterity with its scientific inheritance can well grapple with its own problems. In this as in all things—"sufficient unto the day its own troubles."

Nor do we ignore in this connection the need for conservation born not out of denial, but out of a careful nursing of our present stocks. Let the wheels of progress not stop, but rather proceed unhindered with watchful expenditure of its available energy stores. Chemistry leads the way, and the way of chemistry is neither wasteful nor unmindful of tomorrow.

In England, after Waterloo, all good Englishmen planted acorns so that Britannia might ever rule the waves and never lack for sturdy oak wherewith to build her battleships. It was an idea consummated in pure loyalty, but it bespoke no real vision. For the Englishman builds his battleships today with bands of steel—and his oaks are only fashioned for his coffin.

Concern over the exhaustion of our natural fuel resource is just as unseemly and irrational as the oak planting notion. Of course conservation is wise and necessary—but there is no need for extravagant alarm in this direction. Dr. Slosson, author of that marvellous book *Creative Chemistry*, in his inimitable style handles a prophecy of other fuels in this manner:

> "But our supply of petroleum will sometime run short, in a dozen or fifteen years at the present rate of consumption, according to the estimates of the oil in the ground by the U. S. Geological Survey. Sooner or later at any rate we must grow our fuel, as we grow our food, from year to year. It is interesting now to recall the prophecy of Dr. Diesel, shortly before his mysterious disappearance from the night boat that was carrying him from Germany to England just before the war. He foresaw the time when mineral oil would be exhausted, and then, he said, the supremacy of the sea would go to that power which possessed the most tropical territory for growing vegetable oil. Dr. Diesel has been dead but ten years, yet already in Africa boats are run with palm, cottonseed, and peanut oils. Diesel engines are reported to run on less than ten ounces of cottonseed oil per British horsepower-hour at a thermal efficiency of 24.5 per cent."

And growing our fuel is not nearly as impractical as it seems. We grow a great deal of it as it is. Take the production of alcohol

for instance. A little active seed is planted. Out of the earth and out of the sun-flooded ether the little seedling draws its sustaining energy—and binding the energy in its make-up it grows to full maturity. Man cuts it down, soaks it in water awhile, and through the agency of an added yeast cell, changes its starch to sugar and thence to alcohol. The energy bound by the plant is now contained in the alcohol, whence it can be promptly utilized when needed. In alcohol there is great promise as a fuel, for the forces that the little seedling drew out of the earth and out of the sunlit ether are now locked in the atomic embrace of the fluid alcohol, only waiting an opportunity to work. One only has to imbibe a portion of it to know its availability in this direction.

It is in the integral forces of the inner atom, however, that man may some day find his greatest fund of energy. The physico-chemical studies of radium and radium emanations are still very incomplete, but we know that compressed into the atoms of this amazing element is a measureless amount of electronic action.

Someday perhaps, this or solar energy and other similar forces will be strong in the service of man—whirling the buzzing wheels of industry—changing night to day—mounting the dizzy avenues of air and coursing steady through the lanes of ocean commerce.

Synthetic Chemistry Increases Production.

President Coolidge, speaking recently to the delegates of the American Chemical Society, praised chemistry's service to the nation in peace and war, declaring that the

> ". . . work of the chemist has raised the level of our civilization and has increased the productive capacity of the nation.
>
> "Modern life has become extremely complex. We are enjoying comforts and advantages undreamed of a generation ago. These have become possible to a large measure through the knowledge and work of the chemical profession. Industry is learning to apply the knowledge of the chemist in its processes. Each step by which the products of the soil, the forest, and the air, are converted into commodities of every-day life, requires the expert assistance of the chemist and the chemical engineer.
>
> "Whenever nature's bounty is in danger of exhaustion, the chemist has sought for a substitute. The conquest of disease has made great progress as a result of your efforts.

> Wherever we look, the work of the chemist has raised the level of our civilization, and has increased the productive capacity of the nation. Waste materials, formerly cast aside, are now being utilized."

Industry must be vitally interested in chemistry for it depends upon chemistry and chemical forces for its existence. The conversion of natural resources into commodities of everyday life or else their synthetic production, is the function of the greater part of American industry. And it is to chemistry that industry must and does turn for the consummation of these efforts.

The great organic solvent industry and the dye industry afford ample proof of chemistry's service to industry. Not many generations ago only a king's robe was dyed with Tyrian purple, for the color was immensely expensive. Millions of little molluscs from the Mediterranean bed emptied their little sacs of pigment so that kings and only kings, might sport this special color. Today from the ugly coal tar, the chemist by divers changes secures a Tyrian purple more marvellous than ever dyed an ancient kingly robe, and yet so cheap that little slum-girls wear their clothes giddy with its color.

Yet chemistry, juggling its molecules, is only an infant magician. Each year brings out a host of newer dyes and other organic products. There are endless combinations still untouched.

Agricultural industry owes chemistry a huge debt of gratitude. Time was, indeed, when the world's supply of fixed nitrogen (fertilizing, nutritional nitrogen) so essential to the promotion of life, was rapidly dwindling away. Burning forest consumed much more of this very necessary nutritional nitrogen than the sun and germ and thunderstorm could replace. Then to make matters worse man turned to burning his brother, instead of burying him in earth whence he came. Cremation was thus a chemical crime, for it robbed the earth of much potential fertilizer. Had this process of depletion continued for many millenia with no replacement, the world would have been short of fixed nitrogen—a calamity nigh short of destruction. For a barren, moonlike earth would fail to feed its human parasites. But along came the chemists again, and captured the useless free nitrogen of the air—changed it to fixed nitrogen and made the world safe evermore for hungry democracy. This discovery has notably increased the fertilizing of the soil and the conditions of rural industries are thus vastly bettered.

Biological chemistry has also found other and will continue to find new sources of fertilizing agencies. It is nothing strange today to call to the farmer's aid a willing, tireless army of little germs to prod his backward crop. These little biologic exhorters hang on to the grain rootlets, gather free nitrogen from the air, change it into assimilable, necessary, compounds, and feed it to plants. Thus can the most barren soil be made to support useful vegetable life.

Turn now to the so-called synthetic phase of industry. It is here indeed that industry will ever find its greatest profits. For the modern synthetic chemist builds his compounds as a builder would his home. First he draws a graphic picture of his structural formula just as the architect conceives his plan. Then he brings together his materials and fits them to their proper corners. Here he tacks an ethyl group or there an arsenic atom, and he barters at will his funny molecules until at last is formed his promised compound. This is complicated chemistry indeed, and this was the chemistry that unfortunately gave Germany its fatal conceit.

Food from Test-tube and Crucible.

The common assets of our civilization, such as soap, the alkalies, food products, glass, rubber, celluloid, sugars, alloys, and medicinal substances, all are of the warp and woof of synthetic chemistry. Witness this recital, an omen of the coming day when even food shall come from tubes and crucibles.

> "Starting with beef tallow they get out the stearic acid which contains 18 carbon atoms in its molecule. Then by oxidation they cut off one carbon atom from the chain, leaving 17, a compound known to chemists as margaric acid. This is then recombined with glycerine forming a neutral fat, which can be easily digested by diabetics without leaving harmful acid residues in the blood.
>
> "Neither margaric acid nor fatty acid with a long chain of an odd number of carbon atoms occurs in any natural fat or oil. Some such compounds have been made in the laboratory but only a gram or so has been produced as a chemical curiosity. This is the first time that a purely artificial food has been manufactured in hundred pound lots for use as a regular article of diet."

Quoting again, but from another source, listen to the story of Berthelot, the famous chemist of France.

> "The problem of food is a chemical problem. Whenever energy can be obtained economically we can begin to make all kinds of aliment, with carbon borrowed from carbonic acid, hydrogen taken from water and oxygen and nitrogen drawn from the air. The day will come when each person will carry for his nourishment his little nitrogenous tablet, his pat of fatty matter, his package of starch or sugar, his vial of aromatic spices suited to his personal tastes; all manufactured economically and in unlimited quantities; all independent of irregular seasons, drought and rain, of the heat that withers the plant and of the frost that blights the fruit; all free from pathogenic microbes, the origin of epidemics and the enemies of human life. On that day chemistry will have accomplished a world-wide revolution that cannot be estimated. There will no longer be hills covered with vineyards and hills filled with cattle. Man will gain in gentleness and morality because he will cease to live by the carnage and destruction of living creatures. The earth will be covered with grass, flowers, and woods and in it the human race will dwell in the abundance and joy of the legendary age of gold—provided that a spiritual chemistry has been discovered that changes the nature of man as profoundly as our chemistry transforms material nature."

The current age is the Age of Steel. Steel is a chemical compound. Comparatively a recent discovery, this useful substance is still far from perfection. Contaminated with traces of certain material it loses its strength—yet a little of something else doubles its durability. Other alloys, kindred to steel, are waiting for the co-operative forces of chemistry to lift them to a wider sphere of usefulness. They are simply itching to be discovered. In England today there is a great deal of study under way involving the use of pure metals instead of the near-pure ore products now in use. None of the useful metals find any industrial applications or a state of purity, for all are used as alloys with other metals. Thus since all of the alloys now used are imperfect, it is conceivable that they might approach perfection if instead of the crude elements used in their formation there are used metals more refined or pure.

With this in mind the National Physical Laboratory in London is now just initiating an experimental investigation for the purpose

of studying the alloys of pure iron and chromium, and this, if successful, will be the first occasion on which the systematic study of alloys of pure iron with another pure metal has been undertaken.

This is a type of research in pure science which is bound to be redundant with industrial blessings. It is upon the support and maintenance of this spirit of research, and upon the careful training of picked men to carry on the task that the future of chemistry and the consequent reward of industry depend.

Chemistry Controls Future of Medicine.

Turn now to chemistry in the service of medicine. It was a chemist and not a physician that brought the great truth to medicine. This was Pasteur, the son of an humble tanner from Arbois, lifted by the buoyancy of clear genius into that rare realm of pure science, whose boundless domains few humans are privileged to know; Pasteur, the living contradiction of Pope's famous couplet:

> "One Science only with one genius fit,
> So vast is Art, so narrow human wit."

But not so with Pasteur, for his inspiration led him on from science to science, explaining the old and establishing the new; harnessing chemistry to agriculture and biology to industry. And he was a pioneer, a blazer of new trails. The roads which he chose were the hardest, but they led always to kingdoms that had the things which men sought and longed for, but could not find for themselves.

This was the man who discovered the biological basis of infection. After him followed the discovery of antiseptics used in combating bacteria. Then came also the discovery of the anesthetics: ether, chloroform, and latterly ethylene, all evolved in the chemical laboratory.

The last quarter century has flooded the world with medicinal chemicals derived from every conceivable place. From the cellular spaces of roots and rhizomes, from fractions of crude coal distillate, from desiccated animal tissues, from the minerals in earth's bosom—everywhere—have come remedial agents in response to the chemist's call. And countless more await his beckoning.

Nor indeed is the modern chemist satisfied with the products of Nature's handiwork, for in some respects he can even excel Nature at her own accomplishments. He has bettered her best colors—he has created out of a mass of molecules strange compounds that never existed before. He is unearthing many of her erstwhile inviolate secrets.

In no field of endeavor has chemistry accomplished more, however, than in this field of applied medicine. The anesthetics and analgesics, most of them, in the concrete, products of the laboratory, have lifted heavy burdens of pain from the shoulders of a weary, ailing world. Sickness and travail still walk in the land, but their tread is not nearly so heavy as in the days before ether and chloroform.

In the battle against infection chemistry is still searching and will continue to search into the long years. Here are many problems, stubborn and unyielding, but which under the battering rams of real research will as certainly show a breach in years to come.

Take for example the tedious search for a specific remedy for that dangerous African sleeping sickness. Learn first that this vile disease, a parasitic infestation, renders it physically impossible to progress with the exploitation, commercially and otherwise, of central Africa. Because of its depredations this rich section of that huge continent hoards its treasure as in an ancient unrelenting grave.

The little Tsetse insect, procurer by bite of this vile infection, from any decades locked the treasure troves of Africa's wilds secure against organized colonization.

But where organized colonization utterly failed to gain a foothold—organized chemistry at last has secured the priceless sesame. "Bayer 205," chemical kindred to the renowned 606, promises to cure the sickness and thus make half a continent habitable. Germany, unfortunately, still festering in the toxins of her decomposed conceit, dabbles with this cure and seeks to keep its composition secret. She offers it in return for colonizing concessions. Meanwhile information comes that it has been happily duplicated by French chemists. More power to them. Such indeed are the glorious opportunities of chemistry, and its equally glorious accomplishments.

The causative factor of the great white plague is established —the chemist is searching for the remedy—and he will continue to search until the last lone molecule hangs on to the right place on his remedial structural combination. Cure may come from another source, but the chances are ninety to one that when it comes it will only be again essence of the chemist's crucible.

Cancer is silent with its secret. But it will out with it ere long, and shortly thereafter will certainly come the blessed antidote.

Witness the revival of animal medicine—an attempt to treat disease with Nature's own remedials. Time was when crude botanic drugs from India's jungles or Afric's teeming wilds filled up the shelves of the old apothecary shop. Before that it was essence of bone and elixir of blood—liquid of mummy and spirit of human flesh. Then for a while the world went crazy over coal tar, and most of the medicines came from the garbage heap of the gas works. Today the stockyards of the Middle West are claiming their share of drug shop patronage. The bleating calf, the gentle sheep, slovenly sows and other children of the four-legged race, furnish once more a great bulk of the drug store's healing agents. The day of "extract of menagerie" is still with us, even if the "elixir of botanical garden" is no longer the vogue.

To corroborate the old quip that history truly repeats itself, comes now insulin—the latest addition to our animal armamentaria for fighting disease, for it also is a glandular extract of quadruped. Insulin is designed to fight the dreaded sugar sickness known as diabetes, and insulin after all is second cousin to spirit of bone and essence of blood, for it was out of the suckling calf that Banting and his brother chemists secured the original lot.

But now we are told with definiteness that all of these gland secretions are only chemical compounds which can be duplicated with products made from coal tar and its various derivatives. Pretty soon the chemist claims he will duplicate them all, and then a gland that fails to function right will lose its place and right to serve. So we can now hope for the day when we will carry a vest pocket case containing the chemist supply of compressed extracts, and thus replenish at will our glandular deficiencies. Until then, however, we must depend upon the stock yards to supply our func-

tional shortcomings with crude and empiric extracts of glands from pig or cow or gentle sheep.

But these are only a few illustrations to bear testimony to the fact that the opportunities of chemistry in the field of medicine and public health are without number. Dean Edsall of the Harvard Medical School pointedly evaluates the services of chemistry in this important art in the following statement:

> "The prospect of developments of the utmost importance through chemistry in matters relating to medicine and health in the coming decades is really enormous.
>
> "The progress made in recent years has been such as to warrant confidence that it will be one of the most important lines of progress in the next generation. This is, of course, exceedingly technical work, and fine training is required in order to accomplish anything in it.
>
> "The future progress of medical investigation in no small measure waits upon the results of such chemical research, and the future of medicine depends largely upon the progress of chemistry."

"Chemistry as a Source of New Wealth" was the topic whence this dissertation had its inception. We have wandered far from our trail—it is in the dense woods that we now find ourselves. The cross trails and tree signs have led us astray—but the sun though now obscured still comes up in the east and sleeps beneath the west line, and whether the reader, trailing with us, has "kenned the licht or nae"—chemistry is still prolific in its promises and real wealth is in its vast dominions.

But its promises are not without restrictions. Its treasure troves are not for chance discovery. Unstinted penance shall be made at Pasteur's "Temples of the Future—Temples of Well-being and Happiness—the Laboratories"—for it is there that chemistry's contribution to the world wealth waits for the well-trained seeker.

In this connection the following report of a special committee of Harvard University Board of Overseers is very pertinent:

> "As competition increases the successful man will, more and more, be the man who allows nothing to be wasted, but adopts the most efficient processes and devises new ones still more efficient; who works up his by-products into more useful and further valuable substances; who economizes energy

whether this energy comes from coal or water power or human labor.

"The field is too large and chemical laws too complex to have the results come accidentally.

"They can be accomplished only by a systematic investigation of the whole field of chemistry.

"Only upon the study of pure chemistry and the laws which underlie it can be built the practice of chemical technique, just as our whole modern technique of electricity was built upon the purely scientific experiments of Faraday.

"The present attainment in chemistry has been due chiefly to investigation, undertaken entirely in the spirit of pure science, for science's sake. Upon the support of this spirit, along with the education and training of men fitted to carry on the work, must the future of chemistry depend."

Fringing the Hinterland of Science.

The advance in the last fifty years achieved by scientific method based upon laboratory work is astounding. There is, however, vastly more to be learned. In many of its branches investigation is only at its beginning. Those investigators who have reached the frontiers of knowledge see wide unexplored regions ahead full of problems and full of possibilities.

But mere recognition of the importance of chemistry is not enough to ensure the usefulness of the science in the future. Active steps must be taken to enlist, train, and support chemical investigators and routine workers and to build, equip, and maintain adequate laboratories.

Truly the time and thought investment of the early investigators in the fundamental sciences has already paid tremendous interest. But this is a trivial fraction of its potential returns—for the time will never come when chemistry shall cease to be progressive, for, as Berthelot stated, "Chemistry creates its object and in creating it controls it."

Indeed, the subject of "Chemistry as a New Source of Wealth" will be just as timely in June, 2024, as it is this rambling-rose day in June, 1924.

CORRESPONDENCE.

Cincinnati, October 12, 1924.

Mr. Ivor Griffith,
AMERICAN JOURNAL OF PHARMACY,
Philadelphia, Pa.

My dear Mr. Griffith:

You have done a mighty nice thing in the printing in the AMERICAN JOURNAL OF PHARMACY the "Half Century of Research in Plant Chemistry," in which is given the record of our mutual friend, Dr. Frederick B. Power.

This appeals to me, possibly, perhaps probably, more directly than it can to almost any other man now connected with pharmacy, as I take it you will comprehend if you have the time to read this letter through.

Fifty years ago, I remember in the AMERICAN JOURNAL OF PHARMACY an article from a Mr. F. B. Power, which article was abstracted from his inaugural essay on graduating from the Philadelphia College of Pharmacy, on the subject of resin of podophyllum, a material in which I at that time was deeply interested. That article pleased me mightily, and it was with much pleasure, as you can imagine, that I afterward followed the work of Dr. Power in his various publications.

In 1880 I was Chairman of the Committee on Papers and Queries, of the American Pharmaceutical Association. Professor Maisch brought me at the meeting (1880) a paper from Dr. Power on the subject of Asarum Canadense, which was devoted mainly to the volatile oil of that drug. This was a remarkable study, and it was with great pleasure that, with a little revision by Dr. Power, I presented it to the Association and the world, as chairman of that committee.

Afterward, in 1884, whilst I was engaged in the publication of the work known as "Drugs and Medicines of North America," I thought of Dr. Power, who was then in the University of Wisconsin, in connection with the establishment of the crystalline form of the then little known alkaloid Hydrastine, which I was making in considerable quantities. He took hold of the subject with enthusiasm, and from crystals largely and carefully developed that I supplied him, he made the illustrations accompanying his paper

that he read at the meeting of the American Pharmaceutical Association, 1884. This, afterward revised somewhat by him, was reprinted in *Drugs and Medicines of North America* in the article on Hydrastis, a more complete study, in my opinion, than any other yet made on that drug.

Afterward, when Professor Power went to New York and made a specialty of the study of essential oils, being connected with Fritsche Brothers, I visited him more than once, always in the hope of getting from him information concerning problems in fields he commanded as authority, and never was I disappointed. I recall one visit in which he showed me, for the first time, the material known as Ionol, which had just then been synthetically made in Germany. In connection with this Ionol I will state that he gave me a small vial, which I put into my vest pocket and then forgot. On my return to Cincinnati I stopped off to make a visit to Dr. Simon, of Baltimore. The cork of that vial had become loose and a few drops of the Ionol were spilled on my vest. Professor Simon continually snuffing said, "Lloyd, have you got your pocket full of violets?" I said, "No violets, Doctor, but (it then occurred to me what was the reason for his question), my pocket is full of a wonderful scientific discovery which it pleases me to be the first to bring to your attention, it being a liquid of which I have a few drops in a vial, presented me by Dr. Power, of Fritsche Brothers." The discussion between Simon and myself was a very pleasant one, and I regret much that Dr. Power could not have heard it.

After that, when Power went to England and became prominently connected with Burroughs and Wellcome in the direction of their scientific publications, I read with avidity every article that came from his pen. Indeed, I had been acquainted with Mr. Burroughs, who as a traveling man from McKesson and Robbins, used to discuss with me problems connected with medicine and pharmacy, before he went to England. Hence I felt a common interest in both Mr. Burroughs and in Professor Powers.

Finally, a few years ago, I had the pleasure of meeting Dr. Powers in his laboratory in Washington. Indeed, we had met the previous evening, where a discussion before our association was held in Washington concerning the new research laboratory to be built in Washington, now accomplished. To my great surprise

and delight, Dr. Powers brought to my attention a synthetic compound he had made, paralleling the delightful odor of the June apple, a remarkable thing, and as I went through his laboratory, I felt that it was a great honor for me to receive the attention Dr. Power gave me personally, on that visit.

Now I turn to the frontispiece of your reprinted article from the AMERICAN JOURNAL OF PHARMACY. I see a man past the mature age, reaching up to the three score year and ten mark, I take it, whose very photograph would, I feel sure, inspire one who sees it with the thought that here was a remarkable man, one with a remarkable mind. I cannot but contrast that photograph with the image of the Mr. Power whom I knew in his early manhood, and which, together with the other conditions that now surround me, indicates to me that neither Professor Powers nor myself is today in the class we then occupied.

With my kindest regards and best wishes, and assuring you that this volunteer letter I have written you gives me great pleasure, especially in view of your introductory remarks concerning the work of Dr. Power, and congratulating the readers of the JOURNAL OF PHARMACY on the opportunity you have thus placed before them, I am,

Very sincerely yours,

JOHN URI LLOYD.

MEDICAL AND PHARMACEUTICAL NOTES

THE DICK TEST FOR SCARLET FEVER.—"The usual health of childhood" rather than "the usual diseases of childhood" probably will be the expression commonly used, in medical inspection reports, hospital records, and case histories of the future.

This hope is based upon the announcement, early in 1924, of the work done by Dr. G. F. Dick and his wife, Dr. Gladys H. Dick, of Chicago. Twelve years of persistent research at the McCormick Memorial Institute has apparently established the relationship of certain strains of streptococci with the symptoms of scarlet fever, and has led to the perfection of the test now known by their name.

In its simplest terms, the Dick Test is a skin test by which susceptibility to scarlet fever may be detected. The test is very similar to the Schick Test, now widely employed to detect those non-immune to diphtheria. A minute amount of toxin, obtained from a culture of the scarlet fever streptococcus, is injected between the layers of the skin. It is freely predicted that the time will soon come, in enlightened communities, when the Schick Test and the Dick Test will be given simultaneously.

TESTS OF SENNA LEAVES FOR ANTHROQUINONE DERIVATIVES.—Maurin communicated to the *Bull. d. Sci. Pharm.* in 1922 results of tests of senna leaves. An abstract of the data appears in *Schweiz. Ap-Zeit.* (1924, *62*, 549). Three species in familiar use were tested, *Cassia acutifolia, C. angustifolia* and *C. obovata.* In addition a test was made of the American species, *C. marylandica,* which, however, does not enter the European market, and which proved to be markedly deficient in the ingredient determined. The content of oxymethylanthroquinone in the four species was found as follows:

	Per cent.
C. *acutifolia*	1.55
angustifolia	1.35
obovata	1.10
marylandica	0.65

As several species are now cultivated, tests were made to determine if any difference exists between the such plants and the wild forms. The data show no appreciable difference in content of the anthroquinone derivatives. It was, however, found that by keeping the leaves, the free anthroquinone derivatives slowly enter into a glucosidal association by which the therapeutic activity is lessened. Contrary to what is generally believed, Maurin found that the action of hot water on the leaves does not materially affect their efficiency. H. L.

Bureau of Mines Reports No Ill Effects From Ethyl-Gasoline.—When tetraethyl lead is added to gasoline in the usual commercial concentration of one part in a thousand, automobile exhaust gases result that have produced no ill effects on animals under study by the United States Bureau of Mines at Pittsburgh, was recently announced in a *Science Service Bulletin.*

The Government experts point out that the industrial hazard during the manufacture of the anti-knock compound and the possible danger from its use in automobiles are quite different due to the low concentrations in the exhaust gases.

To test the possible hazard due to the exhaust gases from automobiles using ethyl-gasoline as ordinarily sold, pigeons, guinea pigs, rabbits, dogs and monkeys, over 100 animals in all, were exposed to a definite concentration of exhaust gas from an engine using ethyl-gasoline. The concentration of exhaust gas in air used was that which, when coming from the average automobile would be four parts carbon monoxide in ten thousand parts of air; a concentration allowable for but a period of one hour exposure from the standpoint of carbon monoxide, and exceeding that known to exist in ordinary traffic of a city street.

Two groups of animals were exposed for daily periods of three and six hours, respectively, and the third group not exposed. The animals were observed throughout the test period of eight months for symptoms of lead poisoning, as colic, paralysis, loss of appetite and loss of weight, and there was no indication of lead poisoning. At various times animals were killed and the entire tissues examined for effects of lead and analyzed for stored-up lead.

Observations made on man showed that most of the lead in exhaust gases coming from ethyl-gasoline when inhaled is again exhaled. The investigation indicated the seeming remoteness of any danger of undue lead accumulation in the streets through the discharging of scale from automobile motors.

Carbon Monoxide Poisoning in Small Garages.—The newspapers recently carried a news item of the death from carbon monoxide poisoning, of a prominent Baltimore man, who was found dead in his garage with the engine of his automobile still running. With the onset of colder weather such accidents will probably increase in frequency, says the Surgeon General of the United States

Public Health Service, who warns automobile owners of the danger involved in running a gasoline engine in a small closed space for any considerable period of time.

In tests of the exhaust of a small twenty-three horsepower automobile engine it has been found that it discharged approximately twenty-five cubic feet of gas per minute, samples of which gave an average of 6 per cent. carbon monoxide, or 1.5 cubic feet of deadly carbon monoxide gas per minute. Of course larger engines will give off more. Now a ratio of 15 parts carbon monoxide to 10,000 parts of air is considered a dangerous concentration to be exposed to for a considerable time; and the small twenty-three horsepower engine in "warming up" and giving off only one cubic foot of carbon monoxide per minute would contaminate the air of a small closed garage, 10 by 10 by 20 feet, to the danger point in about three minutes.

Carbon monoxide is a colorless, tasteless, and almost odorless gas. Its poisonous action depends on the fact that it has a much greater affinity for the hemoglobin of the blood than has oxygen—hemoglobin attracting carbon monoxide about 300 times as strongly as it does oxygen. By combining with carbon monoxide, the hemoglobin of the red blood corpuscles is prevented from giving up its oxygen to the tissues. Death results from paralysis of the respiratory apparatus.

The attack of carbon monoxide poisoning comes on insidiously, and consciousness is gradually lost. Even though the victim may become aware of the danger he is often unable to escape from it because of the great loss of motor power.

The automobile worker in a small garage is most frequently the victim. It therefore behooves every person who runs his engine in a small garage to see to it that the room is properly ventilated by having the windows and doors opened if he expects to run the engine for even a few minutes.

A Curious Disease of Grazing-Animals.—Our antipodal brethren see some strange things. They have trees that have no true leaves, merely leaf stalks that stand edgewise and practically throw no shade. They have the animal that lays eggs and nurses its young, and is the only mammal with a specifically venomous secretion. They have trees six hundred feet high, and their plants bloom from

November to March. In the South African region they have the extraordinary *Welwitschia,* that produces only its cotyledons, which, however, are several feet long and several inches broad.

From New Zealand comes an interesting account of a disease that affects sheep and cattle when put out to pasture in certain regions. It is locally known as "bush sickness," because it occurs especially in regions from which the primitive forest has been cleared. The word "bush" is the antipodal equivalent of our word "forest." This disease is marked principally by a steadily increasing anemic condition ultimately resulting fatally. It is developed on pastures where the vegetation is abundant and apparently fully nutritious.

As the disease is a very serious one, stock-raising and wool-clipping being important industries in that part of the world, scientific study of the conditions under which it develops has been undertaken. The results so far obtained have been published in the *New Zealand Journal of Agriculture,* by B. C. Aston, F. I. C., who has had the work in charge. The reports run through several issues, covering portions of volumes 28 and 29 issued in the months of June and July of the current year. The disease is slow in development, symptoms appearing within from five months to a year after the animals have been placed upon the pasture. Steady deterioration in strength and activity occurs and the animals seem to derive no nourishment from what appears to be rich fodder. It is not uncommon to find beasts emaciated and weak, dying in a luxuriant clover area.

Extensive analytical investigations of the soil and the fodder plants have been made by Aston, and it appears that a deficiency of iron is an important difference between the composition of the same kind of plants grown on soil on which the disease occurs as compared with soil that is satisfactory. There is a notable difference in the origin of the "bush-sick" soils and those on which the sickness does not occur. New Zealand is a locality of volcanic activity. Soils are usually the result of weathering of rocks under the influence of water and carbon dioxide, but the "bush-sick" soils of New Zealand are composed of pumice comparatively recently blown out as volcanic ejections and distributed by wind. These materials have been but slightly weathered. They are strongly acidic and contain sulphides which are poisonous to common plants, but which in time may be oxidized to sulphates and become harmless.

For the purpose of thorough study of the cause and treatment of the sickness, an experimental farm was put in operation, and after several years careful experimenting it appears that compounds of iron have been the most efficacious. Iron ammonium citrate has been most used. It is made up with sugar or molasses into bricks which are placed in the feed boxes as "licks" for the animals. Cattle show great avidity for such a lick.

There are numerous indications in the data of biologic chemistry that iron is a very important element in the basic processes of vital action, and Aston's results in this study have added to the interest in the matter. H. L.

FORMALDEHYDE EMBALMING MIXTURES AS INTERFERENCES IN TOXICOLOGIC INVESTIGATIONS.—In a report of interesting and striking cases of poisoning, communicated by Charles D. Howard, Chemist to the New Hampshire Department of Health, and appearing in the *Boston Medical and Surgical Journal* (1924, *190*, 975), reference is made to the fact that as most embalming fluids contain formaldehyde, this substance may seriously interfere with the detection of cyanides in cases of poisoning. It is well known to chemists that formaldehyde reacts with the cyanides to produce compounds in which the reactions of the latter cannot be obtained. The practice of embalming is widespread and its liability to interfere with correct toxicologic investigation is a serious matter. H. L.

NEWS ITEMS AND PERSONAL NOTES

The opening of this year's session at the Philadelphia College of Pharmacy and Science was very auspicious. The enrollment in the freshman Ph. G. class which was limited as usual to 300, showed a higher type of matriculant than ever before. The number of students taking advanced work, and in the B. Sc. courses is unusually large. No changes have been made in the major faculty and few in the instructional corps among the assistants.

The first College assembly was held October first, both juniors and seniors participating. This is the first time that the students have been enabled to attend the assembly at the same time, and is made possible by the fact that another day's work has been added

to the senior year which brings them to College on the same day as the juniors. Plans are again being made for addresses by well-known citizens and educators on topics of general interest or professional character, as this feature of the work was much appreciated by the student body last year.

The organization of a College orchestra is well under way. The outlook is extremely good, although this year's orchestra will have to do unusually well to beat the record of last year's orchestra in the matter of efficiency and popularity. Last year's orchestra was honored just at the close of the college year by being asked to broadcast a dance program from one of the local broadcasting stations.

The Popular Science lecture program for the year has been announced by booklet which has been widely distributed. The attendance at the first lecture was excellent and showed the interest that the general public is developing in this extra collegiate and voluntary work which the members of the faculty are doing. The college has been notified to participate in the broadcasting of an educational program at Gimbel Brothers, broadcasting station WIP. This educational program, which will be given on alternate Tuesday nights, beginning October 7th, will consist of an entire evening of educational features contributed by different professional organizations, and teaching institutions of Philadelphia. This is the second winter in which broadcasting of Popular Science talks has been given. The detailed schedule will be published later.

The new College site, Forty-second, Forty-third, Woodland and Kingsessing Avenues, has been greatly improved by the forty trees which were planted last spring under the auspices of the Alumni Association. These trees were donated by individuals, organizations and classes, and have been carefully protected by the Park Commission, and each one has been labeled with the name of the donor. It is hoped that building may be begun next spring, and plans are going forward with this end in view.

One of the most interesting gifts which the college has had in recent years in connection with its historic collection, is a folder presented by Mrs. Joseph P. Remington, widow of the deceased Dean, containing two indentures, one of John Hart, Professor Remington's grandfather, dated 1787, and one of Jacob Carver, Professor Remington's great grandfather, dated 1747. Not so much was known about Jacob Carver, but John Hart left quite a reputa-

tion in the pharmaceutical world of his time as evidenced by a copy of an obituary published some years ago concerning him. These indentures are in the fireproof of the college for safekeeping but may be seen upon application to the Registrar at any time.

OBITUARY.—"Samuel G. Hart, who for many years was proprietor of the drug store, 24 South Second Street, died at his residence at that number, on the 23d inst., in the seventieth year of his age. Mr. Hart was apparently a hale, hearty man and his death was sudden and unexpected, apoplexy being the cause. There are many interesting incidents connected with the drug store kept by Mr. Hart and the earlier generations of his family. It is related that in the spring of 1771 Townsend Speakman came to this country from England and established himself as a druggist at 20 (then 8) South Second Street, and was, as far as could be ascertained, the first regularly educated druggist this city ever had. An old bill-head, still in existence, locates the store at 'No. 8, four doors below the Friends' Meeting-house and the west side of Second Street.'

"In 1782, John Hart, father of the subject of this notice, was regularly indentured to Mr. Speakman as an apprentice. At his (Speakman's) decease, in 1793, John Hart came into possession of the business, and in the following year married Mr. Speakman's daughter Lydia. It is claimed that John Hart was the first druggist to make what is now so familiarly known as soda water. Professor Physic and Mr. Hart were fast friends, and it is related that one day the Professor got hold of the idea that it would be a great achievement if some way could be devised for introducing carbonic acid gas into the human system. Mr. Hart took up the idea, and, after many trials, and, of course, with very crude apparatus, accomplished the result. It was first used solely as a medicine, and regularly prescribed, but after a while Mr. Hart succeeded in popularizing the drink, and, by adding various syrups, made such a 'hit' that at one time he had three fountains in successful operation. It is not vouched, say the annals, in speaking of him, that he was actually 'the very first to make soda water, but he certainly made it at an early day.'

"Some time before his death, which occurred in 1834, John Hart took his son, John S. Hart, into partnership, and, upon the latter's death in 1838, Samuel C. Hart succeeded him. The latter

removed the store from No. 20 to No. 24, where he continued until February 18, 1879, when Edward H. Kaercross, who had been in his employ for twelve years, succeeded him, and still continues the business. Mr. Hart never married, and it is stated that his death extinguishes that family. As John Hart married a daughter of Townsend Speakman, the business may be said to have remained in the family for more than a century, and it is seldom that one hears of so few changes in that long time.

"It is further related that, when gas was first introduced into Philadelphia the store of John S. Hart was one of the two then prepared to use it."

BOOK REVIEWS

DER COCAINISMUS. A contribution to the history and psychopathology of Intoxicants. By Drs. Ernest Joël and F. Fränkel of Berlin. 8 vo., 111 pages. Julius Springer, Berlin. Paper bound, $1.00 net.

The indulgence in habit-forming drugs has developed into an international problem, yet it is worthy of note that in the earliest written records we have evidence that one habit-forming drug, alcohol, has been in extensive use. The Code of Hammurabi, who is generally regarded as contemporary with Abraham, refers to the liability of the tavern to become a public nuisance, and the incident of the drunkenness of Noah is merely one of a line of instances in the Bible which show the disorganizing influence that alcoholic beverages may exercise on individuals and on society in general. Until the introduction of cocain and heroin, opium and its preparations were the only important habit-forming drugs, except alcohol, but the indulgence in them was rated very differently by the community at large. The drunkard was regarded with general indifference. It was seemingly felt that any one had a right to put that in the mouth which took away the brains. Down to a comparatively late period of the nineteenth century, the courts were

inclined to regard drunkenness as a mitigating circumstance in the case of crime.

The volume in hand is a comprehensive and extensive review of all points concerning the cocain habit, which has become such a widespread evil in recent years. According to the preface, this habit has materially increased in Germany since the war, although it is claimed that it has not yet reached the development recorded in some other countries. The authors' experience covers two years hospital service, as well as private practice, in the course of which they have encountered many victims of the habit who desired to be relieved of it. Present day cocainism they find to be not merely a clinical but also a social phenomenon.

The work is initiated with an account of the source and composition of the drug originally South American, but now cultivated in other tropical lands. Its pharmacology is presented at some length, but as these data are also available in standard manuals, they need not be discussed here. The history of the use of cocain is somewhat exceptional. Classed as an intoxicant and stimulant, its therapeutic value was long unrecognized. The discovery of its local anesthetic action brought it prominently into use, and physicians and pharmacists past middle life can well remember the interest that was awakened by the announcement of its applicability to minor surgery. The active principle was first extracted from the leaf by Niemann and Lossen in Wöhler's laboratory in 1860. Observations on its local action were made by several observers, but Köller's employment of in 1884, in eye surgery was the initiative of the active use. The use of cocain as a remedy for the morphin habit was one of the ways in which it passed into general use as an intoxicant.

The sections of the essay will show the extent and value of the compilation. The pharmacologic and historical notices have just been mentioned. There follow: Symptomatology, cocain psychoses and morphio-cocainism, the forensic significance of the habit, the psychopathology, the habit in its social relations, the differential diagnosis, the trade questions and the control of cocain distribution. A supplement gives a considerable number of clinical histories of cocain users, some points about the German laws on the subject, and some curious scribblings of patients. One example is decidedly incoherent, but there is a seven verse doggerel,

which shows at least some rime and reason. A somewhat free translation of the first verse will show the sentiment:

"Glittering crystals; poison dust,
Wrapped within a packet round;
By it, time to us is lost;
The spell of memory is unbound."

The book is a reprint of an article in a German periodical. It constitutes a thorough study of the cocain-habit in all its phases as as such is a valuable contribution to medical literature. When attention is drawn to such a subject, the question naturally arises, as to why excess in alcoholic liquors should be so leniently regarded by the public at large and by the law even, yet indulgence in other drugs put so severely and widely under ban.

HENRY LEFFMANN.

AROMATICS AND THE SOUL. By Dan McKenzie, M. D. London, William Heinemann, 1923. × + 164 pp. 15x22 cm.

The preface of this delightful book is devoted to an *apologia* for the omission of a reference to the organ of Jacobson in the text. The real preface occurs as the first paragraph of the first chapter, *viz.*, "I sing of smells, of scents, perfumes, odours, whiffs and niffs; of aromas, bouquets and fragrances; and also, though temperately and restrainedly I promise you, of effluvia, reeks, foetors, stenches, and—stinks."

The quotation is characteristic of the whole book; it exhibits the frankness of the discussion, the directness of the treatment, the humanism of viewpoint, and leaven of whimsical humor that abound in its pages. The trivial title of the work but carries out the attitude of the author who needs no ponderous verbiage to lend an air of profundity to his thesis. McKenzie has really produced in a very readable and entertaining book a careful and extended treatise, on the physiology and psychology of olfaction. The work is especially interesting from the point of view of popularizing science for it appears to be a model of non-technical exposition of a very technical subject.

The chapter on theories of olfaction is very well done from a scientific as well as from a popular point of view. Much information is conveyed to the reader in simple terms but McKenzie doesn't

jest much in this chapter. One suspects that he himself is not completely purged of traditional scientific gravity. He misses nothing; we are interested in the odors of disease, the acetone odor of diabetes, the sweet smell of the plague, the mousy odor of favus, or the mawkish stench of typhus. As to the odor of sanctity . . . "It is difficult to account for the pleasant odor of Saints whose pride it was to live without change of raiment. . . ." Oliver Wendell Holmes might have written the following: "The smell of a room full of books is slow to form. Like the bouquet of wine it must ripen. You have to wait. But if you are able to wait, then on fine day you will be welcomed there by the snuggest smell in all the world, which, when once it comes, will forever remain, like rooks in a clump of elms."

McKenzie has already written a book on diseases of the nose, throat, and ear. The reviewer hopes that he will continue his literary activities for the benefit of the race.

J. F. COUCH.

Felix Meiner Verlag in Leipzig favored us with the following volumes for review:

DIE MEDIZIN DER GEGENWART IN SELBSTDARSTELLUNGEN. Herausgegeben von Dr. L. R. Grote, Professor Universität Halle a. S.

This classic work is a collection of autobiographies or as the editor prefers to call them "autoergographies" of scientists of the present time, who were influential in developing medicine and allied sciences, including pharmacy. From the earliest time pharmacy has been the hand-maiden to medicine and for that reason both sciences are intimately connected. The work is published in Octavo volumes, of which thus far three have appeared. Each autoergography is preceded by a photo of the author which are striking portraits of excellent workmanship. At the end of each monograph, a bibliography of the literary achievement of each author in chronological order is appended, an excellent addition to a work of this kind.

Volume I in 227 pages contains the biographies of Alfred Erich Hoche, the psychiatrist of Freiburg; Herrman Kümmel, the surgeon of Hamburg; Felix Marchand, the pathologist of Leipzig; Friedrich Martius, the clinician of Rostock; Wilhelm Roux,

the founder of developmental mechanics (Entwicklungsmechanik) of Halle and Robert Wiedersheim, the anatomist of Freiburg. It might be of interest to learn that the cradle of Professor H. Kümmel stood in an apothecary shop in the little province of Waldeck, famous as the birthplace of Bunsen, Kaulbach, Rauch, Drake, Bier, Klapp and other famous men.

Volume II in 250 pages contains the following autoergographies: Dietrich Barfurth, the anatomist of Rostock; Paul Grawitz, the pathologist of Greifswald; Ferdinand Hueppe, the hygienist of Prag; Hans Horst Meyer, the pharmacologist of Wien; Franz Penzoldt, the pharmacologist and clinician; F. Julius Rosenbach, the surgeon of Göttingen; Friedrich Schultze, the physiologist of Bonn and Hugo Schulz, the pharmacologist of Greifswald. Hans Meyer, a pupil of Ludwig and Schmiedeberg, professor at Dorpat, Marburg and Vienna, and author of the classic work *Experimentale Pharmakologie* (see my review, Apotheker Zeitung, Feb., 1922) has been a prolific worker on the pharmacology of alkaloids. As early as 1880 did he publish the systematic pharmacologic examination of the alkaloids of Jaborandi, determined the elementary composition of pilocarpine and classified it into the nicotine group. The late Prof. Ernst Schmidt of Marburg was in the habit of sending his friend Meyer all the chemicals prepared in the chemical laboratory of the Pharmaceutial Institute for the determination of their pharmacologic action. In this way the pharmacology of many alkaloids of the poppy family and of corydalis, of chelidonine, muscarine, curarine, etc., were determined. In his autoergography Prof. Hugo Schulz very thankfully relates that during his high school studies he visited the Apotheker every Sunday who permitted him to use his microscope, the only one in town. Among the many researches of this celebrated pharmacologist, occupying four pages, I want to call attention to the following: Chemistry of the Toxicity of Arsenic; Oil of Eucalyptus, a non-toxic substitute for Phenol; Congo Red as an Acid Indicator; the oldest German Pharmacopœia; Historical Development of Pharmaco-therapy; Periodic Action of Quinine. Schulz is also the author of eleven text and hand-books.

Volume III in 279 pages, contains the biographies of John C. Hemmeter, the physiologist of Baltimore, Md.; Alexander Koranyi of Budapest, who introduced cryoscopy into urine analysis; Adolf Lorenz, the orthopedist of Wien; Erwin Payr, the surgeon

of Leipzig; Karl Petren, the physiologist and pharmacologist of Lund; Ludwig Rehn, the surgeon of Frankfurt, who made the first successful suture of the heart, and Nicolaas Philip Tendeloo, the pathologist of Leiden. It is a distinct credit to the work that in this volume scientists of other countries besides Germany are considered as *f. i.* Austria, Hungary, Sweden, Holland and last, but not least, the United States. After all, science is international and a biography of this kind must extend all over the civilized world. The work is well printed on good paper and the binding is excellent, in fact, quite imposing.

It is a great work containing the achievements of great men!

VON DEN UEBERSINNLICHEN DINGEN. Von Eberhard Buchner. 323 pp. 1924.

On March 11, 1878, the physicist du Moucel demonstrated Edison's Phonograph before the Académie des Sciences in Paris. As the instrument commenced to talk, one of the aged scientists, Mons. Bouilland, claimed that this was the voice of a ventriloquist. Even six months afterwards, the same man denied that base metal could imitate man's voice. The very same holds true in metaphysics with which subject the book before us deals.

I want to call attention to the following chapters, from a total of thirteen: Animism and Spiritualism, Witchcraft and Superstition, Magic Medicine, Magnetism and Hypnotism, Occult Arts and Sciences, Telepathy, Theosophy and Anthroposophy. Chapter III and IV contains much of interest to pharmacists and Chapter VI is full of historical matter on Alchemy and Astrology. It is a book well worth reading.

OTTO RAUBENHEIMER, Ph. M.

LIKOERFABRIKATION AUF KALTEM WEGE. Von J. H. Fehr. 3. verbesserte Auflage von Hch. Norrenberg. Octavo. 82 pp. Adolf L. Hermann, Berlin, W. 9.

A handy volume from which I will quote the following chapters: Rectification of Alcohol, Freeing it from Fusel Oil, Volatile Oils, Essences and Tinctures, Colors, and Clarification. The statement is made that wood charcoal has a greater absorping power for

fusel oil than animal charcoal. Special attention is paid to Alcoholometers and the different scales. The monograph should be of interest and value to pharmacists.

OTTO RAUBENHEIMER, Ph. M.

PHYSIOLOGISCHE GRUNLAGER DER HYDROTHERAPIE. Von Dr. Georg Hauffe. Octavo. 123 pp. Fischer's Medizinische Buchhandlung. H. Kornfeld, Berlin W. 62.

Just off the press is this monograph on "Physiological Foundation of Hydrotherapy." Hydrotherapy, the application of water to the cure of disease, dates way back to the Roman Empire. The Scottish physician and biographer of Robert Burns, Dr. James Currie (1756-1805), used and advocated cold baths in the treatment of typhoid fever. Cold packs were used in Germany by the Silesian Sigmund Hahn (1662-1742) and his sons. Hydrotherapy was popularized by Max Joseph Oertel and the Silesian farmer, Vincenz Priessnitz (1799-1851) whose cold packs and outdoor methods were followed up by the Bavarian Pastor Kneipp.

This scientific monograph which also contains twenty-nine illustrations and three plates, is a welcome addition to the literature and should become better known in the United States, where a great deal of attention is paid to hydrotherapy.

OTTO RAUBENHEIMER, Ph. M.

The well-known publishers, Crosby, Lockwood & Son, Stationers' Hall Court, London, E. C. 4, submitted the two following books for review:

MODERN SOAP AND DETERGENT INDUSTRY including Glycerol Manufacture. By Geoffrey Martin, D. Sc. (London & Bristol), Ph. D., F. I. C. Vol. I Theory and Practice of Soap Making. Royal Octavo. Cloth 36s.

Up to the present time there exists no complete work dealing with the soap and detergent industry in all its branches. Therefore, the work before us fills a long felt want, especially as the claim is made that all recent processes and discoveries are recorded.

The author, a well-known industrial chemist and engineer, fellow and member of all the important chemical societies, research

director in different industries and author of a number of successful books, dealing with industrial and manufacturing chemistry, is a recognized authority. Therefore a master work can be expected from his pen. Volume I, the one before us, on 400 pages deals with the Theory and Practice of Soap Making, including the Lay-out of Factories, Raw Materials of Manufacture, Calculation of Charges, and the Production of Household and Laundry Soap. The volume is divided into the following seven sections, each one being profusely illustrated:

I Nature of Soap and Detergent Action.
II Organic Raw Materials Used in the Soap Industry.
III Inorganic Raw Materials Used in the Soap-making Industry.
IV Perfuming Substances Used in the Soap Industry.
V Manufacture of Soap from Free Fatty Acids.
VI Boiling Process for the Manufacture of Soap.
VII Household and Laundry Soaps.

The above outline of chapter headings will show at a glance how thorough this subject is treated. And above all, being from a practical man, the processes, formulas, directions and, in fact, all statements, can be thoroughly relied upon. The complete work will consist of three volumes. Volume II will deal with the manufacture of special soaps (also medicinal and pharmaceutical soaps) and detergents, and will include numerous recipes and processes of all kinds which have occurred either in the technical or patent literature. Volume III will deal with the manufacture of glycerol and will include all the numerous recent developments in this branch of the industry.

We wish the work the best success which it fully deserves.

THE PHYSICS AND CHEMISTRY OF MINING. By T. H. Byrom, F. I. C. 5 edition. 12 mo. 232 pp. Cloth 6s.

The author, a mining engineer and research chemist, late analyst to a coal and iron company, and lecturer in a technical college, has produced a practical book, not only of great use to mining students, but also to others interested in this subject. From the eighteen chapters I want to point out the following: The Atmos-

phere, Laws on Gases, Water, Carbon, Explosives, Composition of Coals and Fuels, Methods of Analysis, Fuel Economy and Water Softening. An Appendix contains Useful Tables, including Synonyms, not only useful for mining students but also pharmacists. That the book since 1905 is now in its fifth edition is an excellent proof of its popularity.

OTTO RAUBENHEIMER, Ph. M.

The well-known German publishers, Herder & Co. in Freiburg, Breisgau, submitted the following three books for review. They are all from the pen of Dr. B. Pluess in Basel.

UNSERE BAEUME UND STRAEUCHER. 45 cents. In 132 pages. The author describes the principal trees and bushes together with an identification table according to their leaves and flowers. The illustrations which number 150, are a valuable addition. The little book is now in its ninth edition.

UNSERE GETREIDEARTEN UND FELDBLUMEN. 65 cents. The present, fifth edition, contains 208 pages and 265 illustrations. The author wisely combined the cereals and the wild field flowers which practically grow together. How thorough this little book is can be seen from the fact that twelve pages are devoted to the explanation of botanical terms. The origin, occurrence and uses of the different cereals is also explained and the statement is made, perhaps not generally known, that Australia contains no indigenous cereal.

BLUMENBUECHLEIN. 60 cents. How popular this little book is can be seen that it is in its fifth edition and that eleven thousand copies have been printed, containing 187 pages and 285 illustrations. The description of the flowers in the woods occupies 120 pages. Two keys are given for the identification of the flowers, namely: 1, according to color, leaves and flowers and 2, according to their time of flowering.

We can highly recommend all three books to lovers of nature and quite especially to pharmacists. The last one is rich in information which is very useful to pharmacists and students.

OTTO RAUBENHEIMER, Ph. M.